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ALBERTA HORTICULTURAL RESEARCH CENTER

Alberta
AGRICULTURE

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1986 ANNUAL REPORT

ALBERTA HORTICULTURAL RESEARCH CENTER

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HARVESTING SASKATOON BERRIES

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1986

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DIRECTOR'S REPORT

The Alberta Horticultural Research Center (AHRC) is a branch of the Plant Industry Division in Alberta Agriculture (Appendix II). The Center, located at Brooks with additional facilities at Olds, has province-wide responsibility for research and extension in horticultural and special crops. It works closely with other segments of Alberta Agriculture, particularly the Alberta Tree Nursery and Horticulture Centre, the University of Alberta; Agriculture Canada; Alberta Colleges with horticultural programs; other Alberta Government departments; grower associations, and individual producers.

Several organizational changes were made to AHRC in 1986. The Horticultural Production Section was created by amalgamating the Environmental Horticulture Section with elements of the Vegetable and Special Crops Unit. A Special Crops Unit was created. The Laboratory Services Section was renamed the Crop Protection and Utilization Section.

Several staff changes were made during the year. Rick Rumney (Technologist) was transferred from the Grounds to the Research Greenhouse program, Greg Feth (Technologist) was transferred from the Potato Program to the Grounds program, and Boyd Hanel was appointed as the Potato Technologist. Devon Curry resigned as Potato Agrologist and Ulf Soehngen resigned as Entomologist.

The Center conducted a number of field days in 1986. The Annual Field Day on August 29, with its theme of "Modern Yards and Gardens," attracted over 2,800 visitors. Commodity field days were well attended by commercial producers and continue to be an important aspect of the Center's overall extension activities.

Thomas R. Krahn, M.Sc., P.Ag.

HORTICULTURAL CROP PRODUCTION SECTION

Programs in the Horticultural Crop Production Section provide research and extension services for Alberta's horticultural industries. The objectives of the section are: to improve the quality of horticultural crops produced in Alberta; to increase profits for producers by increasing yields and optimizing management inputs; and to promote the development of horticultural crop production. Industries supported include: fresh, processed, and seed potato; fresh and processed vegetable; greenhouse flower and vegetable; nursery and landscaping; and small and native fruit. Most of the programs include both cultivar evaluation and production research. The seed potato program at Olds produces and supplies disease-free, pre-Elite seed tubers to Alberta's seed potato growers. Extension activities include workshops, short courses, field days, study groups, and individual consultation.

Section Administration and Potato Program - December 31, 1986

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POTATO PROGRAM

Project Leader: C. Schaupmeyer
Technologist: B. Hanel

OBJECTIVES

The objectives of the Potato Program are to assist in the selection and development of improved potato cultivars and to establish methods for improving quality and maximizing economic yields in Alberta's potato industry. This is accomplished through research, extension, and service.

RESEARCH PROJECTS

POTATO CULTIVAR IMPROVEMENT

Prairie Potato Regional Trials.

The Center co-operates in the Prairie Regional Potato Trials in the selection of improved potato cultivars for Alberta's potato industry. Approximately 330 cultivars were grown for evaluation in five trials: the Prairie Adaptation Trial contained 144 cultivars in one replication; two Advanced Adaptation Trials each contained 72 cultivars in four replications; the Prairie Early Replicated Trial contained 14 cultivars in eight replications; and the Prairie Replicated Trial contained 28 cultivars in four replications. Data were collected to a maximum of 39 observations and measurements for each entry in the trials. The Center also evaluated approximately 20 cultivars in the North Central Trial.

The data were compiled and transmitted to Dr. Dermot Lynch, the Agriculture Canada potato breeder at Lethbridge. The Prairie Breeding and Cultivar Evaluation Committee reviewed the data at a meeting in Regina in February, 1987. Promising graduate seedlings from the Prairie Potato Regional Trials will be propagated by the Center in 1987 for industry evaluation in 1988. Results of the regional trials are not published, however, information on clones in the trials may be obtained by contacting the AHRC.

Alberta Potato Industry Cultivar Evaluation. C. Schaupmeyer, B. Hanel, Alberta Potato Commission, and Industry Personnel

Seed of promising graduate potato lines from the 1984 regional trials was propagated at AHRC in 1985; five of these cultivars were grown in commercial fields, and evaluated by processors and the Alberta Potato Commission in 1986. The potato industry has shown interest in several of these cultivars, and they will be field tested again in 1987. Included are: A69868-2, a main-crop French-fry cultivar; W848, a main-crop chipping cultivar; F76080 a main-crop chipping cultivar; MIN9632, a main-crop chipping cultivar. A68710-5, a main-crop French-fry cultivar will be dropped from further testing. NDA8694-3, a main-crop French-fry cultivar will be added to the 1987 trials along with other chipping cultivars for which seed was propagated at AHRC in 1986.

POTATO PRODUCTION IMPROVEMENT

Evaluation of Nitrogen Levels in Commercial Potato Fields in Southern Alberta.

To determine the effects of nitrogen on the quality of French-fry and chipping potatoes in southern Alberta, tissue samples, soil samples, and agronomic data were gathered from 21 commercial fields. Samples were taken from plots in 11 irrigated fields of 'Russet Burbank' potatoes and 10 irrigated fields of 'Norchip' potatoes at bi-weekly intervals, four to six times, in July and August, 1986.

Not all data were analyzed for this report; however, no strong relationships between tissue-nitrogen levels and tuber specific gravity or processing quality were found in the samples taken. The specific gravities for tubers were high in all plots, including those with high levels of nitrogen. Generally, tissue-nitrogen levels were within recommended ranges; however, two plots had excessive levels and several plots had very low levels of nitrogen by mid-August, as determined by both tissue-nitrate analysis and soil analysis. Participating growers will receive individual reports. The study will continue in an altered form in 1987.

Effect of Foliar Applied Nutrients on Yield and Quality of 'Russet Burbank' Potatoes.

Two concentrations of two complete, soluble, foliar fertilizers were applied a total of three times each, at bi-weekly intervals in July and August to 'Russet Burbank' potatoes to determine the effects on yield and specific gravity. No differences in yield or quality were found among any of the treatments. This study will be discontinued.

Effects of Maturity and Speed of Vine Killing on the Incidence of Stem-End Discoloration of 'Russet Burbank' Potatoes.

'Russet Burbank' potatoes, of three different maturities (planted on three dates), were top killed at two different rates to determine if either the plant maturity or speed of killing had an influence on the incidence of stem-end discoloration. Tuber stem-end discoloration was not observed in any of the treatments, including immature tubers from plants that were top killed instantly by removal of the vines. This trial will continue in 1987 with the cultivar 'Norchip' included.

Effects of PPG 1721 Growth Regulator on Yield and Tuber Numbers of 'Russet Burbank' Potatoes.

Two concentrations of PPG 1721, an experimental growth regulator, were applied to 'Russet Burbank' potatoes at two growth stages to determine the effects on yield and tuber numbers. There were no significant differences in total yield, marketable yield, and numbers. The trial will be continued in the Weed Control Program in 1987.

Effects of Alar (daminozide) Growth Regulator on Yield and Tuber Number of 'Russet Burbank' Potato.

Research in England has shown that daminozide (Alar) has increased tuber set and reduced tuber size, which may be beneficial to seed growers. Alar was applied to the foliage of 'Russet Burbank' potatoes at two tuber stages to determine the effects on yield and tuber numbers. There were no significant differences among treatments in total tuber numbers, total yield, nor in the number and yield of small tubers 30-50 mm in diameter. Based on these results and similar results in 1985, this trial will be discontinued.

Effect of Foliar Applied Maleic Hydrazide on Yield, Quality, and Sprouting of Two Potato Cultivars.

Maleic hydrazide (Royal MH 60SG) was applied at two rates to 'Russet Burbank' and 'Norchip' potatoes to determine effects on yield, skin quality, and sprouting. There were no differences in yield or quality of potato cultivars from either treatment.

Tubers of 'Russet Burbank' and 'Norchip,' from a similar trial in 1985, were stored at 6.5° and 10°C, respectively. Sprouting was measured in early April and late May, 1986. Tubers of both cultivars showed some sprout development at the standard rate; however, the total number and total length of sprouts were less than that of the untreated tubers. Sprouting of tubers from plants treated in 1986 will be measured in April and June 1987.

Comparison of Rate of Vine Killing of Two Chemical Vine Desiccants.

Efficacy of dimethipin (Harvade), a new vine desiccant, was to be compared with diquat (Reglone), the most common vine killing agent used in Alberta. Rain, shortly after application of the chemical treatments, affected the results and no comparisons could be made. It was observed, however, that rain approximately 6 hours after application of Reglone did not apparently affect the rate and severity of vine killing. Rain approximately 2 hours after application of Harvade apparently reduced its efficacy and the plot area had to be resprayed.

The Effects of Seed-Piece Type and Spacing on Yield and Tuber Numbers of 'Russet Burbank' and 'Norchip' Potatoes.

Three seed-piece types (whole seed, one-cut pieces, and two- or three-cut pieces) were planted at 15, 20, 25, and 30 cm in-row spacings to determine the effects on yield and tuber numbers of 'Russet Burbank' and 'Norchip' potatoes. There were no significant interactions between seed-piece type and spacing on yields or tuber numbers for either cultivar.

The total number of 'Russet Burbank' tubers was significantly affected by spacing. There was a trend for the whole and one-cut pieces to have higher total yield and total number of tubers. The total yield and number of 'Norchip' tubers were affected by seed-piece type, with the two- and three-cut seed treatments having the lowest total yield and total number of tubers. The total number of 'Norchip' tubers was affected by spacing. Marketable yield and total number of 'Norchip' tubers were also affected by spacing. Seed cut-types tended to affect marketable yield and marketable number of 'Norchip.' This study will continue in 1987.

Evaluation of 'Russet Burbank' Seed Pieces Cut with A Commercial Seed Cutter.

To determine the effects of commercially cut seed-piece types on yield and tuber numbers, a sample from a commercial grower's seed lot was sorted into three seed type groups: whole and one-cut pieces, two- and three-cut pieces, and a mixture of all types that represented the grower's seed lot. All seed pieces weighed 50-60 g.

The whole and one-cut lot had a total yield 43% greater than the two- and three-cut lot, and the total number of tubers was increased by 66%. Evaluation of uniformity of grower seed lots and the influence of seed lot uniformity on seed piece distribution and performance will continue.

Effect of Mini-Tuber Size and Plastic Row-Covers on the Yield and Number of 'Sangre' Potatoes.

There is increasing interest among seed potato producers in growing Elite I seed potatoes from greenhouse grown tubers; however, productivity of small tubers is a concern.

Three sizes of greenhouse-grown Sangre tubers, 7, 21, and 42 g, were grown under two types of plastic row covers to determine the effects on yield and tuber numbers. The tubers were planted 20 cm apart in uncovered potato hills, in potato hills covered with black plastic, and in potato hills covered with black plastic over which clear, perforated plastic row covers were placed.

The row covers tended to increase the total yield and the seed piece weight had a great effect on total yield. There was an interaction between seed-piece weight and row cover on the total number of tubers. Further analysis was not available for this report. The trial will not continue.

Effect of Different In-Row Spacings on the Yield and Tuber Numbers of Four Potato Cultivars.

Seed-pieces of four cultivars, 'Shepody,' 'Carlton,' 'Sangre,' and 'Atlantic,' were planted at five in-row spacings, 15 to 35 cm, to determine the effects on yield and tuber numbers. Generally, the total and marketable yields and numbers were reduced at the wider spacings. This trial will continue in 1987 with two different vine desiccation dates.

Extension and Service Activities

The Alberta Potato Production Guide (Agdex 258/20-8), a comprehensive guide to Alberta potato production for commercial growers, was published in the spring of 1986. Copies are available upon request. The Potato Specialist provided information to potato growers and potato processing companies on potato production.

The main service role of the Potato Program is seed production for the Prairie Potato Regional Trials. In 1986, the Center grew seed of approximately 250 potato clones which will be entered into the regional trials for 1987.

ALBERTA SEED POTATO PROGRAM

Project Leader: J. R. Letal
Technician: W. Davies

OBJECTIVES

The Alberta Seed Potato Program at Olds is involved primarily with the production and testing of pre-elite seed potatoes. In addition, an extension service for production and disease and insect control in seed potatoes is provided. The responsibilities of the research component consist of improving disease and insect control in seed potatoes, and adapting tissue culturing and disease testing techniques to program requirements.

RESEARCH PROJECTS

Testing of Growers' Seed Potatoes for Potato Viruses X and S.

J. R. Letal and Gaye Lepage.[1]

A total of 86 seed potato fields on 21 seed growers' farms were tested for Potato Virus X (PVX) and Potato Virus S (PVS). Of these, 58% of the fields were free of PVX and PVS; 92% were free of PVX, and 62% were free of PVS. Only one field had more than 2% of the plants infected with PVX, and four fields had more than 6% of the plants infected with PVS. Most fields that were free of PVX were also free of PVS, however, the converse was not true.

Extension and Service Activities

The Seed Potato Program distributed 47,000 tubers to Alberta seed potato producers in 1986, and produced 57,000 tubers for distribution in 1987. All basic and nuclear seed stocks were tested for PVX and PVS, potato leaf roll, bacterial ring rot, blackleg, and spindle tuber viroid. All pre-elite seed was tested for PVX and PVS, and for potato spindle tuber viroid.

Monitoring of grass greenpeach aphid and leaf roll was continued. In general, greenpeach aphid numbers were down and levels of leaf roll were very low.

Seed production of new, promising cultivars for grower trials was continued. Seed of these cultivars was distributed to AHRC's Potato Program and Agriculture Canada, Lethbridge, for further increase and subsequent testing on a commercial basis.

Farm visits were made to monitor the quality of seed distributed through the Alberta Seed Potato Program and to assist seed growers with disease and insect control in their seed stocks.

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[1]Food Protection and Inspection Branch, Agriculture Canada, Edmonton.

FRUIT CROPS/ROW COVER PROGRAM

Project Leader: L. Hausher
Technologists: P. Pih - Fruit Crops, M. Briant - Vegetable Row Covers

OBJECTIVES

The Fruit Crop Program provides research and extension for the small fruit industry in Alberta. Strawberries, raspberries, and saskatoons are emphasized, although other fruit crops are being evaluated for commercial potential. Extension and developmental work is done with producers and producer organizations.

The row cover component of the program provides research, extension, and service for vegetable producers. The effects of row cover on earliness, yield, and quality are evaluated. Extension work is done with producer organizations and producers. The service component involves the lending of specialized machinery, and on-the-farm demonstrations.

RESEARCH PROJECTS

Detailed trials are reported in AHRC Pamphlet 87-4, Vegetable Cultural Trials, and AHRC Pamphlet 87-6, Fruit Crop Trials.

FRUIT CROPS - STRAWBERRIES

Evaluation of Strawberry Cultivars for Yield and Winter Hardiness.

In 1983, nine cultivars of strawberries were planted in two identical blocks. One block was protected during the winter with straw mulch, the other had no protection. During three harvest seasons, 1984 to 1986, the straw mulch generally doubled both total and marketable yields of most cultivars. 'Glooscap' and 'Kent,' followed by 'Mic Mac,' consistently yielded higher in both mulched and unmulched trials. 'Glooscap' had the highest hardiness rating.

Evaluation of Forty-Six Strawberry Seedlings.

Seedlings, from crosses made at AHRC, were grown without the aid of winter protection. In 1986, five of the seedlings produced yields of at least 7000 kg/ha (2833 kg/ac). Data for 3 years has shown that six of the seedlings produced at least 5000 kg/ha (2,023 kg/ac) of fruit per year.

Effects of Fertilizer Application Timing on Yield and Hardiness of 'Fort Laramie' Strawberry.

Three dates of fertilizer application, one before and two during harvest, were evaluated. No significant differences in yield or hardiness were observed among treatments.

Effects of Fertilizer Application on Yield and Hardiness of 'Protem' Strawberry.

Four levels of nitrogen were applied in May, 1986. No significant differences in yield or hardiness were observed among treatments.

FRUIT CROPS - RASPBERRIES

The growth of all raspberries continues to be affected by the death of all top growth to ground level during the fall of 1984. Twelve cultivars were evaluated for yield and winter hardiness. The cultivars 'Festival,' 'Boyne,' and 'Honeyqueen' produced over 2500 kg/ha (1000 kg/ac). The cultivars 'Marcy' and 'Wright' continued to freeze to ground level each year. Fifteen cultivars were evaluated in single rows for yield and winter hardiness. The cultivars 'Matsqui,' 'Madawaska,' 'U.S. Latham,' 'Gatineau,' and 'Amethyst' produced greater than 2000 kg/ha (800 kg/ac). Fourteen selections were evaluated in a replicated trial for yield and winter hardiness. Three selections yielded greater than 2000 kg/ha (800 kg/ac). Fifty-one seedlings were evaluated for yield and winter hardiness. Two seedlings yielded greater than 2000 kg/ha (800 kg/ac). Four advanced seedlings and three cultivars were evaluated for yield potential and winter hardiness. One seedling, 'E935-1,' produced over 2500 kg/ha (1,000 kg/ac) and had a 100% plant survival.

Two soil treatments, Symbex[R] and Symbooster[R] were applied at two rates to 'Boyne' raspberries to evaluate their effects. No significant yield or hardiness differences were observed. Four rates of an organic foliar spray solution "Symspray[R]" were evaluated for effects on raspberry hardiness. No significant yield or hardiness differences were observed. The growth retardant daminozide (Alar-85) was applied to raspberry plants at four rates to study its effects on fruit set, production, and hardiness. No significant yield or hardiness differences were observed.

SASKATOONS

Evaluation of Ten Saskatoon Cultivars. L. Hausher and M. Madge[1]

Four cultivars on their own roots and three on cotoneaster rootstock, were established in 1980. Three new cultivars were planted 3 years later. All cultivars were evaluated for yield, fruit weight, and fruit size. The cultivars 'Northline' and 'Smoky,' both on their own roots, significantly out produced all other cultivars. 'Honeywood' was the top producer of grafted cultivars. The best first-year production was obtained from 'Parkhill.' The largest sized fruit was obtained from 'Thiesen' and 'Parkhill.' The heaviest fruit came from 'Thiesen.'

OTHER BUSH FRUITS

Evaluation of Gooseberries, Bush Cherries, and Currants. L. Hausher and M. Madge[1]

Eight cultivars of gooseberries were evaluated for fruit size and yield potential. The cultivar 'Pixwell' had the highest yields and the advanced selection 'M-524' had the largest fruit size.

[1]Seasonal technician.

Cultivars and selections of sandcherries and Mongolian and Nanking cherries did not fruit due to a late spring frost in May, 1986.

Cultivars of red and black currants did not fruit satisfactorily for harvest evaluation due to a late spring frost in May, 1986.

TREE FRUIT

Varietal and Demonstration Orchard. L. Hausher and M. Madge[1]

Three orchards, two varietal and one demonstration, were maintained for the purpose of specimen identification, nurserymen assistance, and public information.

ROW COVERS

PLASTIC TUNNELS

Evaluation of Polyethylene Mulches and Row Covers on Vegetable Crops.

Both black and clear polyethylene mulches in combination with clear, perforated, polyethylene tunnels were evaluated for their effects on earliness and yield of summer squash, winter squash, eggplant, and hot peppers.

Summer squash cv. 'Zucchini Select,' grown through black mulch with the aid of a tunnel, had the highest yield and earliest production. A 4-year summary of the data showed that the black mulch tunnel treatment

[1]Seasonal technician.

consistently outyielded other treatments. Winter squash cv. 'Golden Hubbard,' grown through clear plastic without a tunnel, had the highest total yield. Data from 3 years has shown that this was consistently the best treatment for increasing yields. Eggplant cvs. 'Dusky' and 'Black Bell' transplants, which were grown using the combination of clear mulch and tunnels, had yield increases of up to 100% of those obtained using hot caps.

Evaluation of Tunnel Ventilation.

The density and location of ventilation holes on tunnels were evaluated for their effects on 'Earlipik' pickling cucumber. All plantings were made through black polyethylene mulch. Ventilation hole densities, of 10-30 cm apart, and a slitted type of ventilation were evaluated. The effect of ventilation holes located at the top and bottom was also evaluated. There were insignificant differences in total yield among the ventilation hole density treatments. A 3-year summary of the trial also indicated no significant differences in yield between the ventilation densities.

Evaluation of Plant Density.

A study was conducted to evaluate the effect of double-row versus single-row seeding with and without black, polyethylene mulch and tunnels. The mulch and tunnel treatment with two seeded rows, at one-half the seeding rate per row, resulted in the highest total yield.

The bare-soil treatment, with a double row at one-half the seeding rate, increased yields by 75% over the same amount of seed placed in a single-row.

Plant Protection Systems - Temperature Monitoring.

Air and soil temperatures were monitored on five frost protection systems from April 11 to May 15. Soil temperatures under clear mulch and tunnel, and black mulch and tunnel were the highest of all treatments on warm and cold days. Hot caps increased air temperature the greatest on cold days, while tunnel treatments were the hottest on warm days.

Fall Frost Protection.

A spun polyester material (Reemay^{R}) was evaluated for light fall frost protection on pumpkin, cucumber, tomato, and pepper. The material protected plants and fruit of all crops through light frosts (-1.2°C), thereby allowing an increase in the growing season.

Early Spring Seeding with Mulches and Tunnels.

The effects of early seeding on sweet corn and muskmelon (seed) with the aid of mulch and tunnels was evaluated. A sweet corn, cv. 'Sunny Vee,' seeded April 23 in mulch with tunnels, was first harvested July 6. The sweet corn, cv. 'Northlite,' seeded on May 8 in mulches and tunnels, was first harvested from July 6 to July 15. Sweet corn, 'Northlite,' seeded May 9 in a cultivar trial, was first harvested August 19.

Pregerminated muskmelon seed planted on May 7 through mulch, and covered with a tunnel, gave satisfactory fruit yield and quality before frost.

Effect of Cereal Windbreak Protection on Vine Crops.

Fall rye was seeded in the fall of 1985 to act as a windbreak protection for the 1986 crop of cucumbers and pumpkins. The rye was planted in 4-m strips, and cucumbers and pumpkins were planted in 10-m strips in between the windbreaks.

Slight increases in yields of cucumbers were observed in the protected area but these were not statistically significant. No statistically significant yield or earliness differences were observed in the pumpkins.

VEGETABLE PROGRAM

Project Leader: P. Ragan
Technologist: T. Maruno

OBJECTIVES

The Vegetable Program serves the fresh and processing vegetable industries through applied field research and extension activities. The fresh vegetable industry includes commercial and market garden producers. Current research projects emphasize cultivar evaluation and earliness enhancement of crops through cultural management. Potential for further mechanization of the industry is also being investigated.

RESEARCH PROJECTS

CULTIVAR EVALUATION

There were 650 cultivars of vegetables on trial in single-row evaluation. Cultivars of cole crops, direct seeded and transplants, were screened for earliness and quality characteristics. Super sweet corn cultivars, particularly earlier maturing types such as 'Sugar Bun' and 'Northern Super Sweet,' performed well. Yellow bell peppers were planted for the first time and showed good potential. 'Nantes' carrots are now being grown commercially, however, root brittleness is a major concern.

Details on cultivars tested are reported in AHRC Pamphlet 87-5.

CULTURAL TRIALS

Details on all cultural trials conducted are reported in AHRC Pamphlet 87-4.

Plant Population.

Plant population trials with several vegetable crops were performed to determine ideal plant populations for southern Alberta conditions.

Three population treatments on processing wax beans, approaching a maximum of 545,000 plants per hectare (225,000 plants per acre), did not produce any significant yield response. Maturity was not affected by plant population pressures. Maturity of processing corn was delayed significantly as plant populations increased. A slight increase in yield occurred as plant population decreased. This was evident in both an increase in number of cobs per plant and cob length. Plant density of processing carrots in the row could exceed 55 plants per metre (18 plants per foot) without jeopardizing root size. Population threshold is yet to be determined. Pod length of processing peas increased significantly as seeding rate rose to 257 kg/ha (104 kg/ac). There was a slight delay in maturity and an increase in yield.

Lower yields and larger heads of cauliflower early transplant resulted from decreasing plant density. Between-row spacing appeared to have less influence on maturity and yield. Three years of cauliflower late transplant trials failed to identify a yield response to changing plant population. There was some indication that both yield and head size were reduced as in-row and between-row spacings increased, and it was assumed that this yield response was largely due to a reduced number of plants per hectare (acre).

A 3-year broccoli trial studied the effect of two factors, in-row and between-row spacing, on earliness and yield. Both factors were manipulated to either increase or decrease plant population. In-row spacing was shown to be of greater importance. Neither factor enhanced earliness, however, a reduction in between-row spacing produced higher yields at first harvest. The advantage of decreasing between-row spacing is somewhat limited by the need to cultivate between rows and harvest with large scale equipment.

In-row spacing was shown to have a significant effect on total yield, primary head size, and weight. By increasing plant populations, total yield could be increased and head size could be reduced and therefore be more acceptable in size for market.

Succession Seeding.

Several trials to determine the effect of succession seeding of vegetables grown in southern Alberta were conducted.

There was a significant delay in maturity of processing corn as it was sown later on a 10-day seeding interval. Yield response indicated that a decline occurred with mid- to late May seedings, however, the response was not significant. On a 10-day seeding interval, carrots sown early to mid-May produced significantly higher yields. Yields of Canada #1 roots were also significantly higher in all seedings. On a 10-day interval, broccoli maturity was significantly delayed in early and late seedings as opposed to mid season sowings. Yield did not vary appreciably with sowing date. Both the largest and heaviest primary florets occurred in late May and early June seedings because of rapid growth.

Fertilizer.

The effects of different fertilizers and rates of fertilization were studied on several vegetable crops.

There were no significant effects of nitrogen fertilizer on carrots as the rates of nitrogen applied increased from 0-420 kg/ha (0-170 kg/ac) above a reserve level of 17.8 kg/ha (7.2 kg/ac). Three years of study on the effect of rate and time of application of nitrogen fertilizer on cooking onions showed that increased rates of nitrogen delayed maturity of onions; particularly when the fertilizer was applied preplant as opposed to a mid season sidedress application. Marketable yield decreased with additional applications of nitrogen. Onions grown in a short-season climate should not have high soil nitrogen levels when early crop maturity is desired. There was no significant response in yield of cooking onions to application rates of phosphorus of up to 667 kg/ha (270 kg/ac).

Other Trials.

Winter (fall) Seeding - Seeds of several crops were sown October 31, 1985. Germination, compared with spring sown seeds, was reduced as follows: carrots 50%, onions 28%, spinach 46%. All winter-sown crops matured earlier (2 to 3 weeks) and produced higher yields on a per plant basis than spring sown crops.

Soiltex Anticrustant - Granular Soiltex® did not significantly improve seedling emergence in carrots and onions. Problems encountered with top dress applications included wind assisted movement and inactivation of the anticrustant during periods of low moisture.

Extension and Service Activities

Equipment loan, precision seeder calibration, field days, production courses, on-farm demonstrations, tours of production areas, and a service of consulting and direction are all provided to producers. Many projects and functions are conducted co-operatively with seed companies, plant breeders, producer organizations, and government personnel.

GREENHOUSE CROPS PROGRAM

Project Leader: G. Grant
Technologist: R. Rumney

OBJECTIVES

The Greenhouse Crops Program maintains a strong commitment to evaluating new technologies and plant material for the Alberta greenhouse industry. Research is conducted on all aspects of greenhouse production, including cultivar trials on flower and vegetable crops as well as research into new

hydroponic technologies and co-operative work on pest control. An extensive program of technology transfer is conducted with grower study groups, visits to individual growers, and participation in the Alberta Greenhouse Growers' Association.

Service is provided to various agencies: the Alberta Agricultural Development Corporation, the Protected Crops Advisory Committee, and the Alberta Horticultural Advisory Committee. Assistance is provided to the Regional Crop Laboratory in diagnoses of physiological and nutritional disorders of greenhouse crops.

RESEARCH PROJECTS

VEGETABLE CROPS

Vermiculite Bags as a Growing Medium for Greenhouse Cucumber Production.

Two cultivars of cucumbers were grown in plastic bags filled with fine-grade vermiculite. Three root-zone temperatures were maintained. Plants were irrigated with a strong fertilizer solution (EC = 2.5) similar to that used with rockwool substrates. Yields varied from 1.3-2.2 cucumbers/plant/week. Vermiculite appears to be a good substrate for cucumber production, as nutrients are readily available to plants and rapid uptake occurs.

Results are available in AHRC Pamphlet 86-18 available on request.

Production of Cucumbers on Rockwool Substrates.

The purpose of this research program was to establish nutrient and management programs for cucumber production on rockwool and to evaluate cultivars for production on rockwool slabs. Fertilizer management programs were developed. 'Brudania' was the highest yielding cultivar followed by 'Vitalis' and 'Nun 4467.' This trial will be continue during the 1987 and 1988.

Preliminary results are in AHRC Pamphlet 86-18.

Short Cropping of Greenhouse Tomatoes.

Short cropping tomatoes to six flower trusses has been suggested as a means to increase early season yields of greenhouse tomatoes. This experiment was initiated to evaluate short cropping of five cultivars of greenhouse tomatoes grown in woven plastic bags containing a peat-lite mix. Plants were seeded from December, 1985, to March, 1986, at monthly intervals. Plants were topped after six trusses. 'Jumbo' had the highest yield in both the December and March planting, yielding 11.5 and 15.5 kg/m^2, respectively. Short cropping of tomatoes may be a viable alternative management program provided the second replacement crop can be seeded 4-6 weeks prior to removal of the first crop.

Results are available in AHRC Pamphlet 86-18 available on request.

Hydroponic Production of Romaine Lettuce in the Greenhouse.

This experiment was initiated to develop management programs and evaluate cultivars for production of Romaine lettuce in the greenhouse. Four cultivars of lettuce were grown on two brands of rockwool. Lettuce grown on Grodan® rockwool consistently produced heavier heads. Head mass varied from 210 g for cv 'Lobjoits' to 360 g for cv 'Paris White.' This experiment will continue in 1987 with lettuce grown in a nutrient film technique system.

Preliminary results are available in AHRC 86-18 available on request.

ORNAMENTAL CROPS

Production of Alstroemeria.

This experiment was initiated to develop management strategies for alstroemeria and test cultivars suitable for production in Alberta. Six cultivar of alstroemeria were transplanted into beds containing an artificial mix in November, 1985. Marketable flowers were first cut between late March to mid-April. Plants were placed in a rest phase after the last cut on July 10, 1986. The top producer was 'Jacqueline' with 73.4 stems per plant followed by 'Red Valley' and 'Valeria' at 65.2 and 54.8 stems per plant, respectively. 'Alsaan,' an older cultivar, produced only 26.4 stems per plant. Estimates of gross sales for Jacqueline are $\$288/m^2$, based on \$5.50 per bunch of eight stems and six plants per m^2.

This trial will continue in 1987. Interim results have not been reported.

Evaluation of Growth Media for Poinsettia Production.

This experiment was initiated to evaluate three different media mixes for poinsettia production. Artificial mixes composed of 20% soil, 40% peat, 40% vermiculite; peat and vermiculite; and peat with 20% rockwool were tested with 'Annette Hegg' and 'Margo' series of poinsettias in 10- and 15-cm pots. Both the vermiculite and rockwool treatments produced larger flowers and more bracts per plant than the soil treatment. The rockwool treatment tended to produce more flowers per plant, whereas the vermiculite treatment tended to produce slightly larger flowers. The 'Margo' reds produced richer reds and greens than the 'Annette Hegg' dark reds. These experiments will continue in 1987.

Interim results have not been reported.

Evaluation of Media for Bedding Plant Production Using Moderately Saline Water.

This experiment was initiated to evaluate salt (NaCl) accumulation in bedding plant media and the benefit of using hygroscopic rockwool to improve media porosity and consequently drainage and leaching of salts. Three mixes were used: peat:vermiculite:sand; peat:sand:rockwool; peat:rockwool. Treatments with rockwool reduced the level of salts in the media. Sodium chloride levels in the peat:rockwool treatment were approximately 30% lower than in the peat:vermiculite:sand treatment.

This experiment will not be continued.

Extension

Approximately 265 individual grower visits were conducted throughout southern Alberta, and 25 study group meetings were held in the Redcliff and Medicine Hat areas. A spreadsheet to analyze greenhouse grower costs was developed. As well, a greenhouse soil test database was developed and annual summaries were sent out to growers in southern Alberta. The Greenhouse Crops Specialist assisted in the organization of the 1986 Alberta Greenhouse Growers' Association Convention by acting as program co-ordinator.

ORNAMENTALS

Project Leader: E. B. Casement
Technologists: N. Seymour, G. Feth, G. Smith

OBJECTIVES

The Ornamentals Program has three functions: Research, Extension, and Service. Research is conducted on the propagation and production of ornamental plants. As well, ornamental plant material is evaluated for hardiness. The nursery industry in Alberta is assisted through extension, while the AHRC grounds and the Golden Prairie Arboretum are maintained as a service function.

RESEARCH PROJECTS

WOODY ORNAMENTALS

Prairie Regional Trial for Woody Ornamentals. E. B. Casement and N. Seymour

This co-operative trial, initiated in 1958 under the auspices of the Western Canadian Society for Horticulture to evaluate hardiness and ornamental value, involves ten other test sites on the prairies. There have been 701 entries; each was tested for 5 years before recommendations on their suitability was made to the nursery industry.

There were 15 entries from the Canada Agriculture Research Station, Morden, Manitoba, planted in 1981. These were evaluated in 1986. Eight are recommended for general planting in the Brooks area, two are recommended for trial planting, four are unsatisfactory, and one was destroyed by deer browsing. Two entries were received for testing in 1986.

Hardiness and Evaluation Trial for Woody Ornamentals. E. B. Casement and N. Seymour.

Since 1918, 382 specimens of woody plant taxa have been received from nurseries, institutions, and private citizens. Of the 21 entries donated in 1981 by nurseries and research institutes, two entries were recommended for general planting in the Brooks area, nine were suitable for planting in protected areas, and the rest were unsuitable.

In 1986, nurseries[1] donated 26 cultivars or species of trees and shrubs including five rhododendrons,[2] for trial.

Plant Introduction Scheme of the University of British Columbia. E. B. Casement and N. Seymour.

In 1983, AHRC, one of five co-operators outside of British Columbia, received the first entries in this trial. None of these entries survived the winter of 1984/1985 and no entries were received in 1985. Two entries were received in 1986, a Potentilla sp. and Salix lantana.

Further information on these Hardiness and Evaluation Trials is available by requesting AHRC Pamphlet 87-3, Woody Ornamental Plant Trials.

Regional Woody Plant Test Program. E. B. Casement and N. Seymour.

This co-operative trial between the Landscape Alberta Nursery Trades Association and Alberta Agriculture commenced in 1983. Evaluations are conducted at AHRC and nurseries in southern Alberta. In 1986, an additional 21 entries were planted at AHRC bringing the total to 103 entries; 19 entries were planted at Foothills Nursery, Calgary, bringing the total to 106 entries; and 16 were planted at Coaldale Nursery, Coaldale, bringing their total to 90. AHRC staff plant and take records of the three southern sites while staff at the Alberta Tree Nursery and Horticulture Centre, Edmonton, co-ordinate the trial and supervise four other sites in northern Alberta.

Further information on this trial is available from the Director of the Alberta Tree Nursery and Horticulture Centre, Edmonton.[3]

Forest Genetics Trial. E. B. Casement and N. Seymour

This trial is maintained for the Alberta Forest Service, which is co-operating with Proctor and Gamble Cellulose Ltd., Grande Prairie, to test the effect of latitude changes on growth rates and time-to-flowering of several tree species. Presently, there are grafted white spruce clones, seedling white spruce strains, and seedling tamarack, Englemann spruce, black spruce, lodgepole pine, Raivola larch, and Siberian larch on trial.

Results have proven that precociousness has occurred in the Grande Prairie selections of the four species.

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[1] Eighteen were donated by Mrs. Wallace of Beaverlodge Nursery.
[2] Bailey's Nursery, St. Paul, Minnesota.
[3] R. R. 6, Edmonton, Alberta, Canada T5B 4K3

Roses. E. B. Casement and G. Smith

Five new shrub roses were added to the collection in 1986. Severe winter injury was observed on many roses in the rose garden in the spring of 1986, and 17 of the hybrid tea roses were killed. Although there was an average level of bloom in 1986, iron chlorosis of the leaves was higher than usual, with many cultivars showing symptoms for the first time.

The rose overwintering trial indicated that the leaf mulch provided better protection than peat moss, soil, or the microfoam thermal blanket for the hybrid tea roses.

NURSERY PRODUCTION

Propagation Trial. E. B. Casement and N. Seymour

Softwood cuttings were taken from 20 different types of plants each Thursday for 13 weeks, starting on May 22, to determine if there was an optimal time for rooting. At the same time, flowering dates of a wide range of plants were recorded. This was done to base recommendations for taking cuttings on the flowering time of specific plants rather than calendar dates.

Container Overwintering Trial. E. B. Casement and N. Seymour

Containerized plants, grown in three soil mixtures and protected by four different methods, were evaluated for winter survival. There were no differences in plant survival and spring growth among the treatments. This might have been due to the lack of severe cold periods during the winter.

Fertigation of Container Grown Plants. E. B. Casement

This trial, funded by Farming for the Future, was conducted at Eagle Lake Nurseries, near Strathmore, to compare fertigation with slow-release fertilizer on container-grown nursery stock. In 1986, the three treatments were: Nutricote® (slow release, coated fertilizer) in the media, 60 ppm nitrogen from 20:20:20 fertilizer, and 200 ppm nitrogen applied at each watering through the irrigation system (fertigation). Rooted cuttings of nine different species of plants were potted into 3.8-L pots (No. 1 container) containing the regular media, used by Eagle Lake Nurseries, with or without Nutricote. The tenth species was transferred to 7.2-L pots (No. 2 container) using the same potting media with or without Nutricote. The media used for the fertigation treatments did not contain any Nutricote.

Some of the plants (Cornus sericea, Potentilla fruticosa, Spiraea x Bumalda) exhibited a significant increase in growth with fertigation. Caragana pygmae had reduced growth with fertigation compared with Nutricote in the media and others exhibited no differences.

This trial, with an increased number of treatments, will continue for one more year.

ANNUAL AND PERENNIAL FLOWERS

All-America Selection Annual Flower Trial. E. B. Casement and G. Feth

Fourteen entries were compared with 20 of the best similar cultivars in this trial in 1986. The most unusual entry was an early yellow Coreopsis. Two other entries, a double rose petunia with white edges and a ruffled scarlet zinnia, were rated as being eligible for the All America's Selections award.

Twenty six award-winning entries from 1981 to 1985 were grown along side the trial for demonstration.

Annual Flower Trial. E. B. Casement and G. Feth

Seeds of 117 cultivars of annual flowers were donated by six major seed producing companies for trial planting. Of these, 15 were judged to be superior based on quality and quantity of bloom and plant habit.

Further information on the Annual Flower Trial is available by requesting AHRC Pamphlet 87-2 Annual Flower Trials - 1986.

Gladioli. E. B. Casement and G. Smith

There were 18 new cultivars added to the collection in 1986. Jingles, Encore, Gold Flour, and Picasso were judged to be best, based upon bloom quality, blooming period, and floret placement.

Heavy rains in September exacerbated disease problems. Many corms showed signs of disease at harvest which intensified during storage.

SERVICE PROJECTS

Arboretum. E. B. Casement and N. Seymour

There are 514 specimens of woody plant taxa in the Golden Prairie Arboretum, most of which have been planted in the past 5 years. Eight specimens were planted in 1986.

The Siberian or mistletoe aphid (Hydaphis tataricae) has become established on most Lonicera tatarica cultivars and hybrids: Lonicera tatarica 'Arnold Red' was the only cultivar not affected. Crown rot of lilac was found in some lilacs during the summer.

Demonstration Orchard. E. B. Casement and N. Seymour

The demonstration orchard was assigned to the Ornamentals Program in the spring of 1986. Seven apple trees ('Norland,' 'Parkland,' 'Westland,' 'Brookland,' 'Rosybrook,' 'Sunnybrook,' and 'September Ruby') were added to the orchard.

Grounds and Bedding Plant Production. E. B. Casement and G. Feth

The annual flowers that were planted in the flower beds on the grounds for show were the same cultivars that were planted in the annual flower trial. This gave the visitors to the Center an opportunity to see new cultivars of annual flowers both in trial rows and in landscaping situations.

CROP PROTECTION AND UTILIZATION SECTION

This section conducts research, extension, and service programs in plant pathology, entomology, weed control, post-harvest physiology, food processing and quality evaluation, and plant diagnostics. Support is provided to production programs at AHRC and to agricultural industries and individual producers, both amateur and commercial, in Alberta. Crop pest surveys, diagnoses of disease, insect, and weed problems, pesticide efficacy testing, evaluation of storage practices, and food product development are examples of some of the work carried out by section staff. Research and extension projects are done co-operatively with other AHRC staff and federal/provincial research agencies. Close working contacts are maintained with commercial commodity and scientific organizations in Alberta and beyond.

Section Administration and Plant Pathology

Ronald J. Howard, B.S.A., M.Sc., Ph.D., P.Ag. ..... Section Head and Plant Pathologist
Karen Chapman ..... Section Secretary
Edward Moskaluk ..... Laboratory Technician

Post-Harvest Program

Ken Mallett, B.Sc., M.Sc., Ph.D., P.Ag. ..... Post-Harvest Specialist/ Plant Pathologist
George A. Smith, Dipl. Hort. ..... Technologist

Food Processing & Quality Evaluation

Terrance Smyrl, B.Sc. (Hons.), M.Sc., Ph.D. ..... Food Scientist
Margaret Dench .....Laboratory Technician
Joseph Hung, B.Sc., ... Laboratory Technician

Weed Control

Rudolph Esau, B.S.A., M.Sc., P.Ag. ..... Weed Control Specialist
Vicky Rumney, Dipl. Agr. ..... Technologist

Regional Crop Laboratory

Marilyn Dykstra, B.Sc. (Ag), M.Sc. ..... Diagnostician
Steven Slopek, B.Sc., M.P.M. ..... Diagnostician
(Contract employee through Olds College)

Entomology

Ulf Soehngen, B.Sc., M.Sc., Ph.D. ..... Entomologist
Arthur Tellier, Dipl. Hort. ..... Technologist

Project Leader: R. Howard
Technician: E. Moskaluk

OBJECTIVES

The Plant Pathology Program has a mandate to conduct applied research on important diseases of specialty crops, fruits, greenhouse crops, and selected cereal, oilseed, and forage crops. These studies encompass field, laboratory, and greenhouse experiments, as well as disease surveys. Findings from this work and from the research of other scientists are presented to producers through extension. Service is a third activity which primarily involves providing consultative backup to the Regional Crop Laboratories at Brooks and Olds. Some plant pathology projects are also discussed in the reports of the Post-Harvest and Regional Crop Laboratory (Olds) Programs.

RESEARCH PROJECTS

DISEASES OF CEREAL CROPS.

Winter Cereal Seed Treatment Trials. R. Howard, E. Moskaluk, F. Harper[1] and B. Puchalski[2]

Seven registered and experimental seed treatment fungicides were evaluated for control of common bunt (Tilletia caries, T. foetida) on winter wheat and stem smut (Urocystis occulta) on fall rye. On wheat, all products except carbathiin (Vitavax) Solution 23% SN, at the label rate, effectively controlled seed-borne bunt. Neither formulation or rate of Vitavax was effective in controlling soil-borne bunt. All products tested controlled seed-borne stem smut on rye. Only carbathiin + thiram (Vitavax Powder) 58% DU failed to effectively control seed- and soil-borne stem smut. Details of these trials were reported in the 1986 Pesticide Research Report of the Expert Committee for Pesticide Use in Agriculture, Agriculture Canada, Ottawa.

DISEASES OF PULSE CROPS

Development of Ascochyta Blight on Dryland Lentils. R. Howard, E. Moskaluk, and K. A. A. Morrall[3]

'Laird' and 'Eston' lentils, with different levels of seed-borne Ascochyta lentis, were planted on a dryland site at AHRC. Foliar incidence readings of Ascochyta blight were taken in June, and the plots were harvested and threshed in August to determine yields. Only a trace infection of blight occurred in the plots. Disease incidence and seed yields had no statistically significant correlation with initial seed infection levels. Assays of seed to determine the percentage of Ascochyta infection are pending.

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[1]Head, Plant Pathology Section, Agriculture Canada, Lethbridge.
[2]Technician, Plant Pathology Section, Agriculture Canada, Lethbridge.
[3]Professor, Univ. Saskatchewan, Saskatoon

Evaluation of Fungicides and Application Methods for the Control of White Mold on Dry Peas.

Benomyl (Benlate) 50% WP and iprodione (Rovral) 50% WP fungicides were evaluated for their ability to control white mold (Sclerotinia sclerotiorum) on dry peas. The fungicides were applied as single and double treatments using equipment which simulated aerial, ground and chemigation application methods. Hot, dry weather during August, coupled with a thin stand resulting from too low a seeding rate, created unfavorable conditions for white mold development. At harvest, no statistically significant yield differences were observed among treatments. Details of this trial were reported in the 1986 Pesticide Research Report of the Expert Committee for Pesticide Use in Agriculture, Agriculture Canada, Ottawa.

Effect of Fall Subsoiling on the Yield of Processing Peas, Soft Wheat, and Sugar Beets.

A Howard Paraplow was used to subsoil plots (0.6-2.0-ha) in five fields north of Vauxhall in October, 1985. In spring, 1986, three fields were seeded to processing peas and one each to sugar beets and soft white spring wheat. The plots were maintained the same way as the rest of the field by each co-operating grower. At harvest, separate yields were taken from the subsoiled and non-subsoiled areas of each field and compared. In two of the three pea fields, the subsoiled plots yielded 0.5 and 23% lower than in the non-subsoiled plots, while in the third field the subsoiled area outyielded its non-subsoiled counterpart by 7.6%. In the soft wheat, the subsoiled and non-subsoiled plots both yielded 76 hL/ha (85 bu/ac). Sugar beet yield in the subsoiled area was 0.7 t/ha (2 tons/ac) less than in the non-subsoiled area. This trial will be discontinued.

Evaluation of Processing Pea Cultivars for Resistance to Fusarium Root Rot.

Eleven cultivars of processing peas were planted in non-replicated blocks in a commercial field near Coaldale. The field was naturally infested with Fusarium spp. and other root rotting fungi. At maturity, plant samples were taken from each plot and measured for yield, quality, and root rot. 'Almota' yielded the highest, followed closely by 'Dual.' 'H-680' and 'Trident' produced the lowest yields. 'Sun Valley' had the lowest incidence of root rot, followed by 'Almota,' 'Headliner,' and 'Stampede.' These cultivars also had low severity ratings of root rot. 'H-680' had a 100% incidence of root rot and the highest disease severity (2.4 on a 0-3 scale).

DISEASES OF GREENHOUSE CROPS

Evaluation of Fungicides and Soil Wetting Agents for Control of Pythium Damping-Off on Cucumbers. R. Howard and M. Briant

Ten fungicides and three wetting agents were evaluated, alone and in combination, for their ability to control Pythium damping-off of 'Earlipik' cucumbers in greenhouse trials. The fungicides and wetters were tested at one half, one, two, three, four and five times their label rates. The metalaxyl-containing fungicides (Subdue and Apron products) provided the best control of damping-off and generally exhibited very little phytotoxicity,

even when applied at five times the label rate. Addition of the wetting agents to the soilless growing medium (peat moss + vermiculite) enhanced the efficacy of several of the fungicides, but Aqua Gro 'L' was phytotoxic.

Efficacy of Imazalil Fungicide for Control of Powdery Mildew on Greenhouse Cucumbers. R. Howard, E. Moskaluk, and R. Rumney

Imazalil (Fungazil) fungicide was applied, either as a smoke bomb or foliar spray, to six cultivars of cucumbers to determine its efficacy in controlling powdery mildew. Applications were started shortly after the disease was detected in the crop. The smoke bombs failed to arrest the mildew, whereas the sprays provided acceptable control. However, the sprays were phytotoxic to young cucumbers and slowed their growth. Yields were generally increased by the sprays, but not by the smoke bomb treatments.

DISEASE SURVEYS

Blackleg of Canola. Twenty-nine canola fields in Census Divisions 2, 3, 5, and 6 were surveyed for blackleg (Leptosphaeria maculans). The virulent strain of the fungus was not detected in any fields; however, the mildly virulent strain was detected in several fields.

Sugar Beet Cyst Nematode on Canola. Soil samples were taken from 17 canola fields in the Bow Island-Lethbridge area and assayed for sugar beet cyst nematodes. None was found.

Verticillium Wilt of Alfalfa. Fifty-two alfalfa hay fields in Census Divisions 2, 5, and 6 were surveyed. The disease was found in six fields in Division 2 and three fields in Division 5. The three fields in Division 5 were located 8 km north of Rockyford, and represent the most northerly occurrence of the disease in Alberta to date.

Extension and Service Activities

AHRC Plant Pathology staff spoke at several growers' meetings, workshops, and short courses. They also made regular contributions to the AHRC Crop Protection Newsletter. In addition, various AHRC pamphlets, scientific journal papers, and miscellaneous publications were prepared. Liason was maintained with district agriculturists in Region I and the southern part of Region II. Staff were also active in several professional societies and advisory committees. Diagnostic assistance was provided to the AHRC Regional Crop Laboratory.

FOOD PROCESSING AND QUALITY EVALUATION

Program Leader: T. Smyrl
Technicians: M. Dench and J. Hung

OBJECTIVES

The objectives of the Food Processing and Quality Evaluation Program encompass three main areas: 1) to develop new methods for processing horticultural crops; 2) to support AHRC production research by providing chemical and processing data, and 3) to assist in the establishment and improvement of horticultural processing industries in Alberta.

RESEARCH PROJECTS

Characteristics of Small Fruits Grown in the Peace River Region of Alberta. T. Smyrl, J. Hung, M. Dench, and J. Davidson[1]

As in 1985, samples of numbered varieties of chokecherries and rosehips, harvested from research plots in the Peace River Region, were analyzed for selected physical (berry size, flesh weight, seed size) and chemical (sugars, moisture, vitamin C) characteristics. It is expected that this information will be used in the overall evaluation and selection of numbered varieties for large-scale commercial planting. This trial will continue in 1987.

The Use of a Starch-Based Coating to Improve French Fry Quality. T. Smyrl and J. Hung

Fries treated with a starch-based coating were evaluated for quality parameters, including texture, color, and oil absorption, and compared with an untreated control. On the basis of these measurements, it was concluded that the processor would not gain an overall advantage by using the starch-based coating during French fry production in comparison with the untreated control.

Assessment of the Moisture Content of Onions Using a Refractometric Technique. T. Smyrl and J. Hung

This project was initiated to determine if the moisture content of onions could be determined by the refractometric technique rather than the more time-consuming vacuum oven technique. Refractometric measurements on onion juice, from both fresh and stored onions, correlated significantly with moisture contents determined by the vacuum oven technique. Thus, the refractometric technique may be used to give a faster estimation of moisture content of fresh and stored onions.

Progress on the Development of Sulfite Alternatives for Potato Processing. T. Smyrl and M. Dench

A dip consisting of an aqueous solution of organic and inorganic acids was found to prolong the shelf life of prepeeled potatoes, especially when the

[1]Agriculture Canada Research Station, Beaverlodge, Alberta.

treated samples were vacuum-packaged. However, the treated prepeeled potatoes developed a thin, tough, outer skin when cooked. This project will be continued with the objective of eliminating this skin formation upon cooking.

Significance of Glucose Levels in Potatoes at Harvest. T. Smyrl and J. Hung

One hundred and forty-three newly-harvested potato samples were analyzed for glucose and sucrose (YSI Sugar Analyzer) and total reducing sugars (3,5 diniatrosalicylate technique). In addition, all cv. 'Norchip' samples received were chipped. The results showed that the glucose content did not correlate with sucrose concentrations or chip color score; however, significant correlations were found between glucose and total reducing sugar. The glucose content of the tubers at harvest was not significantly correlated with the ability to process potatoes into chips immediately after harvest. This project will continue in 1987.

Vitamin C Content of Potatoes Grown in Western Canada. T. Smyrl, J. Hung, J. Mullin[1] and D. Lynch[2]

Vitamin C and moisture content were determined on seven potato cultivars shipped to AHRC from each of the following locations: Portage la Prairie, and Morden, Manitoba; Outlook, Saskatchewan; and Edmonton and Brooks, Alberta. Portions of the potato samples were sent to Ottawa for iron analysis. This work is part of a Canada-wide project to assess the nutritional value of potatoes grown in Canada.

Physical Characteristics of Saskatoon Berries Grown at AHRC. T. Smyrl and M. Dench

The saskatoon cultivars 'Regent,' 'Success,' and 'Moonlake' had the least number of seeds per berry, the smallest sized seeds, and the lowest seed: weight proportion per berry. These cultivars may find potential use in processed saskatoon products which include the saskatoon berry seed. This project will be continued in 1987.

Extension and Service

Extension activities involved work with processors of horticultural crops. For example, raw materials of a particular cultivar were provided to a processor to check the suitability of the cultivar for processing; as well, laboratory or small-scale processing equipment was supplied to processors. Time was spent by program personnel in local processing plants in either a quality control or product/process development capacity. Several co-operative projects were conducted with Alberta Agriculture's Food Processing Development Centre in Leduc.

The service activities of the Food Processing and Quality Evaluation program included work which was done in the Culinary and Analytical Laboratories on materials submitted for analyses by AHRC production-oriented

[1]Agriculture Canada Food Research Centre, Ottawa, Ontario.
[2]Agriculture Canada Research Station, Lethbridge

research programs, e.g., the Potato, Post-Harvest, Vegetable, Greenhouse, Fruit, Weed Control, and Irrigation programs. The Analytical and Culinary Laboratories performed chemical, processing, and sensory tests on fresh, processed, and stored horticultural crop material from on- and off-Center research plots. Examples of chemical analyses performed in the Analytical Laboratory were: sucrose, glucose, fructose, carotene, chlorophyll, protein, ascorbic acid, pH, moisture, and glycoalkaloids. In the Culinary Laboratory, fruits and vegetables were canned, frozen, deep-fried, juiced, boiled, baked, roasted, etc. These processing tests were normally followed by either objective or subjective quality analyses by taste panels.

POST-HARVEST PROGRAM

Program Leader: K.I. Mallett
Technologist: G. Smith

OBJECTIVES

The Post-Harvest Program includes research, extension, and service in Post-Harvest Physiology and Plant Pathology. The Plant Pathology responsibility is in potato, vegetable, tree, turf, and ornamental commodities. Extension is done for commodity groups, individual growers, and for commercial mushroom farms. Current research projects are reported below. The service component of this program aids the AHRC Regional Crop Laboratory and the Prairie Potato Breeding Program headquartered at the Agriculture Canada Research Station, Lethbridge.

RESEARCH PROJECTS

HANDLING AND STORAGE OF VEGETABLES

Effect of Fungicide Treatment on Cabbage Quality During Storage.

To determine if fungicides could control disease losses due to mould growth during storage, two late cabbage cvs., 'Ultragreen' and 'Storage Red,' were treated with four fungicides. Benomyl + Manzate 200 80% WP (Benlate + Dithane M45), Vinclozolin (Ronilan) 50% WP, and iprodione 50% WP (Rovral 50% WP) were sprayed on cabbage one week before harvest, and a Benlate dip was used after harvest. Fungicide-treated cabbage had significantly smaller mould losses in the later part of the storage period than the check. This trial will be completed after the 1986-87 storage season.

Enumeration and Identification of Micro-organisms from the Air, Walls and Cooler Water of a Filacell.

Bacteria and fungi were isolated from cooler water, air, and walls of a filacell storage. The identity and population of the microbes differed for each of the sample locations. This trial will be continued.

DISEASE OF POTATOES

Disease Screening Trials for the Prairie Potato Breeding Program. K. Mallett and D. Lynch[1]

Potato seedlings from the Prairie Potato Breeding Program were screened for resistance to early blight and Rhizoctonia canker diseases. Of the 35 potato seedlings screened for early blight resistance, 33 were identified as having intermediate resistance. A successful inoculation technique was developed for screening potatoes for Rhizoctonia resistance. This trial will be continued in 1987.

Evaluation of Fungicides for the Prevention of Seed-Piece Decay in Potatoes. K. Mallett and C. Schaupmeyer

Six fungicides, Agrox Seed Piece Dust (mancozeb 16%), TF 3664, Fir Bark (Mancozeb 16% + fir bark), Easout Potato Seed Piece Treatment (thiophanate-methyl 10% diazinon 0.2%), Polyram 7 Dust (Methram 7%) and Rovral, were evaluated for prevention of seed piece decay of potatoes. Fungicide treatments did not affect stand count or date-to-50% emergence, but did give significant differences in total and marketable yield. This trial has been completed and a detailed report can be found in the 1986 Pesticide Research Report of the Expert Committee for Pesticide use in Agriculture, Agriculture Canada, Ottawa.

DISEASES OF TREES AND TURF

Epidemiology of the Fairy Ring Fungus *Marasmius oreades*.

A study on the establishment of M. oreades fairy rings in turf grasses was initiated. Results indicated that spores are the principal inoculum source for fairy rings in southern Alberta. This project will be continued.

Effects of Antitranspirant Chemicals on Winter Desiccation of Conifers. K. Mallett, E. B. Casement, and N. Seymour

Three antitranspirant chemicals (Wiltpruf^{R}, Foligard^{R}, and Folicote^{R}) were applied to Norway spruce, white spruce, and Scots pine to determine if the chemicals could prevent winter desiccation. Preliminary results showed that some stomates were plugged with antitranspirant chemical after the winter.

Extension and Service Activities

Post-harvest staff provided extension information to growers and agricultural professionals in the following areas: storage of vegetable and nursery crops, diseases of potatoes, vegetables, trees, turf and ornamentals, and commercial mushroom production. Information and laboratory support was provided to help growers of the oyster mushroom (Pleurotus spp.), a so-called exotic mushroom.

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[1]Agriculture Canada Research Station, Lethbridge.

Post-harvest staff performed bacterial ring rot diagnostic tests on potato plant samples collected during the annual inspection of commercial potato fields in southern Alberta. Of 33 specimens submitted, 5 (15%) were diagnosed as positive. This was lower than in 1985 when 8 of 37 (21%) were diagnosed as positive. A disease survey of commercial potato fields in southern Alberta showed that early blight, Rhizoctonia, blackleg, and wilts are the most important diseases found in this crop. White mould, caused by Sclerotinia sclerotiorum, was found in potato fields near Taber and Vauxhall. This is of interest as the disease has previously been found only once in Alberta.

Assistance was provided to Dr. D. Lynch, Agriculture Canada, Lethbridge, in roguing field-grown lines of potatoes in the Prairie Potato Breeding Program at Vauxhall, and in inspecting experimental plots for the AHRC potato program.

WEED CONTROL PROGRAM

Project Leader: R. Esau
Technologist: V. Rumney

OBJECTIVES

The major objectives of the Weed Control Program are: to improve existing weed control practices for vegetables, potatoes, nursery, fruit, and special crops by evaluating commercial and experimental herbicides; to assist staff at the AHRC Regional Crop Laboratory with the diagnoses of herbicide injury on crops and identification of plant specimens; and, to provide weed control information to commercial and amateur growers. Further details of all research trials appear in the 1986 Research Report of the Expert Committee on Weeds (Western Canada).

RESEARCH PROJECTS

Weed Control in Pulse Crops.

In weed control trials with drybeans, AC 263,499, an experimental herbicide from American Cyanamid was evaluated. It was applied at several rates as preplant incorporated (PPI), pre-emergence, and postemergence treatments. On the basis of crop yields and observations, AC 263,499 did not cause significant crop injury. Control of lamb's-quarters was rated as acceptable-to-excellent and did not appear to be affected by the timing of the treatment. Trials with AC 263,499 will be continued.

Weed Control in Potatoes.

A trial involving preplant incorporated or pre-emergence treatments was conducted. None of the treatments was superior to the standard treatment, EPTC + metrabuzin. This trial will not be continued due to lack of potential new treatments.

In a second trial, 19 treatments, consisting primarily of graminicides applied with or without metribuzin (Sencor, Lexone), were evaluated for control of annual grassy and broadleafed weeds. None of the five graminicides tested caused any significant injury to potatoes. Efficacy of sethoxydin (Poast) appeared to decrease when it was tank-mixed with metribuzin. This study will be continued in 1987.

The effects of potato seed-piece size on the tolerance of cv. 'Shepody' potatoes to metribuzin was investigated. Plants from large seed pieces (80 g) showed less crop injury shortly after application than those from small seed pieces (40 g). This project is under review.

Weed Control in Vegetable Crops.

Onions - Since ioxynil (Totril) was taken off the market without advance warning, most onion growers in Alberta did not have an adequate supply for the 1986 growing season and therefore had to rely on oxyfluorfen (Goal). A trial was initiated to determine whether bromoxynil (Pardner, Torch), which is registered in parts of the U.S., could replace ioxynil. In an onion tolerance trial, bromoxynil was applied at three rates to three onion varieties at the one-, two- and three-true-leaf stages. Onions suffered initial injury from bromoxynil but, at harvest time, the yield and number of bulbs per metre from the treated plots were not significantly different from the weed-free check. This trial will be repeated next year.

In other trials, repeated low rates of oxyfluorfen and bromoxynil, starting at the one-leaf stage of onions, were found to be superior to single applications of higher rates applied at the two-leaf stage.

Carrots - Evaluation of fluorochloridone (Racer) vs. the standard linuron treatment was completed in 1986. In addition to yield and weed control data, the carotene contents of the carrots were also determined for all treatments. Fluorochloridone at 1.0 kg a.i./ha (0.40 kg/ac) provided weed control which was equal to the standard but, at lower rates, it did not adequately control common groundsel.

Peas - In one trial, cyanazine (Bladex) at 0.5 kg a.i./ha (0.20 kg/ac) alone did not provide adequate weed control in peas. However, control was improved when cyanazine was combined with either MCPA sodium salt or MCPA potassium salt.

Three graminicides (DPX-Y6202-31, HOE 033171, and TF 1195) were tested at several rates for control of annual grasses. DPX-Y6202-31, at 50 g a.i./ha (20 g a.i./ac), controlled green foxtail and barnyard grass, and it was found to be compatible with metribuzin. Trials will be continued next year.

Sweet Corn - The effect of delaying incorporation of two thiocarbamate herbicides, cycloate (Marathon) and EPTC/R25788 (Eradicane), was investigated. Sweet corn was not affected by either herbicide. Delaying incorporation by seven hours did not affect efficacy in this trial.

Two experimental products (SC-0774 and SC-0051) from Stauffer Chemicals were tested in another trial for broad-spectrum weed control. Future work on these products will depend upon company plans for further development.

Graminicides - HOE 033171 (Excel), RE 45601 (Select), and sethoxydin (Poast) did not cause any noticeable injury to cabbage, cauliflower, carrots and onions. Variations in control of five annual grass species were noted for the three herbicides tested. The addition of ammonium sulphate to sethoxydin enhanced grass control. Evaluation of graminicides for horticultural crops will be continued in 1987.

Zucchini Squash - Herbicide recommendations to growers are inadequate for controlling weeds in squash. In one trial, two soil fumigants, dazomet (Basamid) and metam sodium (Vapam), were evaluated in conjunction with chloramben (Amiben) herbicide for weed control. Three weeks prior to seeding, metam sodium was applied via drip irrigation and dazomet granulars were incorporated with a rototiller. Clear plastic mulch was placed on the soil shortly after dazomet was incorporated. Chloramben herbicide was applied and the drip irrigation hoses were laid just prior to placing the plastic mulch. Dazomet and chloramben treatments controlled common purslane, the major weed under the plastic, and resulted in the highest zucchini yields. This trial will be repeated in 1987.

In a second trial, the efficacy of EPTC (Eptam) and chloramben under clear plastic mulch vs. bare ground was compared. This trial, in modified form, will be repeated next year.

Weed Control in Nursery Crops and Shelterbelts.

Weed control demonstration trials are currently in progress at two commercial nurseries in Bowden and Coaldale. Linuron, oxyfluorfen, and oxadiazon were applied in late fall to Manitoba maple, Villosa lilac, chokecherry, and green ash.

No trials were conducted with containers because container-grown nursery stock propagated for weed control trials did not survive the 1985-86 winter. In 1987, trifluralin will be evaluated as a surface-applied treatment for container seedlings.

Herbigation.

Bromoxynil appeared to provide better weed control on onions when applied with a conventional sprayer than by herbigation. Weed regrowth was extremely heavy, yields were not taken. Due to the poorer weed control by herbigation, this treatment will not be repeated.

Three herbicidal treatments, metribuzin (Sencor, Lexone) + EPTC (Eptam), metribuzin + haloxyfop methyl (Verdict), and metribuzin + metolachlor (Dual) were applied through a herbigation simulator to three

potato cultivars, 'Russet Burbank,' 'Norland,' and 'Norchip.' The treatments were applied after hilling, when weed growth was minimal. No crop injury was detected and yields were not significantly affected by the treatments. These herbicide treatments controlled redroot pigweed and wild mustard.

HERBIGATION FOR EXPERIMENTAL APPLICATION OF HERBICIDES

Response of Rotational Crops to Chlorsulfuron and Metsulfuron methyl (DPX-T6376).

Metsulfuron methyl (Ally), applied at 0, 3, 6, 12 and 24 g a.i./ha (0, 1.2, 2.4, 4.9, and 9.7 g a.i./ac) in 1984, did not appear to affect any of five rotational crops (barley, lentils, potatoes, canola, and alfalfa) in 1986. This trial is complete.

Plots treated with chlorsulfuron (Glean) at 0, 10, 20, and 40 g/ha (0, 4.0, 8.1, and 16.2 g/ac) in 1981 have been replanted annually with rotational crops (lentils, alfalfa, and potatoes) to assess carry over of this herbicide. Residues resulting from application of chlorsulfuron at 10 and 20 g/ha in 1981 appear to have dissipated, based on the response of sensitive rotational crops; however, the 40 g/ha still had an effect in 1986. The 1981 trial will not be replanted next year; however, an identical trial initiated in 1982 will be replanted once more in 1987.

Weed Control in Small and Native Fruits. R. Esau and S. Case[1]

At the Sexsmith test site, five herbicidal treatments were re-applied in 1986. New shoot growth of saskatoon seedlings was not affected by any of

[1]Fruit Growers' Society of Alberta, Sexsmith

the treatments. A directed spray, to the base of the shrubs, of linuron (Lorox, Afolan) at 4 kg a.i./ha (1.6 kg a.i./ac) tank mixed with paraquat (Gramoxone) at 0.75 kg a.i./ha (0.30 kg a.i./ac), oxyfluorfen (Goal) at 2 kg a.i./ha (0.81 kg a.i./ac), and linuron at 4 kg a.i./ha (1.6 kg a.i./ac) were the best treatments. These plots, however, were infested with dandelions which were not adequately controlled by any of the three treatments. Weed control will be evaluated in 1987 to assess residual herbicide activity.

In a trial to control quack grass in an old saskatoon orchard, glyphosate (Roundup) had fewer quack grass shoots (136 shoots/m^2) than the check (390 shoots/m^2); however, none of the other treatments was significantly different from the check. Glyphosate caused minor injury to saskatoon suckers, but no damage was observed on the mature shoots. Although haloxyfop methyl (Verdict) did not cause any injury to saskatoons, its control of quack grass was slightly inferior to that of glyphosate. This trial will be continued in 1987.

Extension and Service Activities

A weed tour, held on July 29, was attended by 34 people. The weed research plots were also visited by Alberta and Saskatchewan vegetable growers (August 11 and July 24, respectively), regional directors and specialists (August 7), and Montana agricultural specialists (July 3). Vegetable and nursery growers were visited during the growing season, and several incidents concerning suspected herbicide injury on cereal crops were investigated. Other extension information relating to weed control in horticultural and special crops was provided to growers by telephone or letter.

Service activities included providing weed control recommendations to AHRC personnel, maintaining the pesticide storage building, and procuring pesticides used at the Center.

ENTOMOLOGY PROGRAM

Project Leader: U. Soehngen
Technologist: A. Tellier

OBJECTIVES

The Entomology Program conducts research and provides extension and diagnostic services. Research is directed toward major pest problems on selected horticultural crops. Extension is provided to Alberta's agricultural industries, individual growers, and Alberta Agriculture field staff. Diagnostic services are provided for clients of the AHRC Regional Crop Laboratory and AHRC researchers. Pest control recommendations are often

made in conjunction with diagnoses and as the result of routine inquiries by commercial and amateur producers.

RESEARCH PROJECTS

CONTROL OF CORN INSECT PESTS.

Effect of Planting Date on Infestations of European Corn Borer.

Infestations of European corn borer (Ostrinia nubilalis) in 'Sunny Vee' sweet corn, seeded on May 13, 20, 22 and June 17, was evaluated in mid-September. Forty stalks were randomly harvested from each treatment and examined for larvae. Plots seeded in May were moderately infested, while plots seeded in June remained relatively free of corn borer.

Effect of Timing of Insecticide Spray for Control of European Corn Borer.

'Sunny Vee' sweet corn, seeded in mid-May, was sprayed weekly with permethrin (Ambush 50 EC) for six weeks. Peak flight of adult corn borers occurred during the second week of July and remained high throughout the month. Optimum control was obtained with six weekly applications of the insecticide, starting at the beginning of July. Best control was achieved with six weekly applications. Control decreased as the number of weekly applications was reduced from five to one.

Insecticide Efficacy for Control of European Corn Borer.

Plots of 'Sunny Vee' sweet corn, seeded in mid-May, were treated with three insecticides: permethrin (Ambush 50EC), HOE 000522 (No Molt SU), and chlorpyrifos (Lorsban 4E). Each insecticide was applied twice, two weeks apart in mid-July, when flights of corn borer moths were at their peak. The treatments were evaluated in mid-September by harvesting 40 stalks at random from each plot and counting the numbers of larvae and tunnels. HOE 000522 proved to be the most effective, followed by permethrin and chlorpyrifos.

Evaluation of European Corn Borer Damage in Sweet Corn.

In mid-August, 40 mature cobs of 'Sunny Vee' corn were selected at random from six experimental plots and weighed. Plants were harvested in mid-September and the stalks were examined for corn borer damage. A comparison of permethrin (Ambush 50EC)-treated and untreated husked, fresh cob weights showed a significant reduction in cob yield for plants infested with corn borers. This largely unrecognized loss in yield, as the result of reduced plant vigor, is in addition to the direct loss of marketable corn resulting from the infestation of cobs.

Evaluation of European Corn Borer Damage in Grain Corn.

A similar trial to that described above for sweet corn, was carried out with 'Pioneer 3995' field corn. There was a significant reduction in the weight of kernels harvested from insecticide-treated plots relative to the check. This hybrid may have been susceptible to damage from permethrin (Ambush 50EC) insecticide, even though it was used at the manufacturer's recommended rate.

Survey of Adult European Corn Borers. U. Soehngen, A. Tellier, D. Strubble,[1] and southern Alberta District Agriculturists

In 1986, the highest corn borer populations in southern Alberta occurred between Medicine Hat and Burdett. Adults were trapped in low numbers in the area between Lethbridge, Taber, and Brooks. Although no moths were collected at AHRC, several larvae were found in corn grown at the Center.

Burial Trials of European Corn Borer Larval.

In the fall of 1985, pieces of corn stalks infested with corn borer larvae were buried at depths of 30, 23 and 15 cm, and some were placed on the soil surface. Soil temperatures were recorded at all depths throughout the winter, and the pieces of corn stalks were examined in May, 1986. The results of this trial, as in a previous one, showed that corn borer larvae were able to survive when buried to a maximum of 30 cm. Although it is unlikely that developing moths will dig their way to the surface from this depth, spring tillage may expose pieces of corn stalk, thereby facilitating emergence.

CONTROL OF CABBAGE INSECTS

Insecticide Efficacy for Control of Thrips.

Eight-week-old seedlings of 'Stokes Viking Golden Acre' cabbage were transplanted at the end of May. Beginning in mid-July, plots were sprayed once each week with deltamethrin (Decis 5E) at two rates, dimethoate (Cygon 4E), and HOE 000522 (No Molt SU) until the end of September. On a weekly basis, two heads of cabbage were harvested from each treatment and the numbers of onion thrips (Thrips tabaci) were counted. Only deltamethrin at the high rate adequately controlled thrips.

Susceptibility of Cabbage Cultivars to Thrips.

Eight-week-old seedlings of 'Early Marvel,' 'Tucana,' 'Red Danish,' and 'Stonehead' cabbage were transplanted at the end of May. Beginning in mid-July, two heads were harvested from each plot of every cultivar and numbers of onion thrips were counted. 'Early Marvel' proved to be the most attractive to thrips, while 'Red Danish' had the fewest thrips and least amount of damage.

Extension and Service Programs

Dutch Elm Disease/Elm Bark Beetle Survey. U. Soehngen, A. Tellier, and R. Mallett

Fourteen pheromone traps for the European elm bark beetle and fourteen trap logs for the native elm bark beetle were placed at all border crossings from the United States into Alberta and at various locations across southern Alberta. Several cords of firewood, confiscated at the U.S. border from tourists entering Alberta, were inspected for the presence of the fungal pathogen, Ceratocystis ulmi, and for the beetle vectors. Several logs with

[1]Agriculture Canada, Lethbridge.

beetle galleries and one containing elm bark beetle larvae were found. The firewood was burned by AHRC personnel. One European elm bark adult beetle was found on a pheromone trap.

Cutworm Survey. U. Soehngen, A. Tellier, and M. Dolinski[1]

A survey was conducted for Bertha armyworm and several species of cutworms. Traps were set out and changed periodically in several locations in the Brooks area. Cutworm moths were sent to B. Byers, Agriculture Canada, Lethbridge, for identification and tallying. Results are pending.

Canadian Leafcutter Bee Cocoon Testing Centre. U. Soehngen, A. Tellier, and P. Tognet[2]

The Cocoon Testing Centre operates under the direction of the Canadian Alfalfa Seed Council and is supported by the fees charged to growers for sample analyses. AHRC provides physical facilities, advice, and some direct assistance.

The Cocoon Testing Centre, which operated from November 1, 1985, to April 15, 1986, received 324 samples for analysis. Forty-one samples containing Ascosphaera aggregata, the fungus which causes chalkbrood, were received from Alberta, three from Manitoba, and one from Ontario.

Research Project on Control of Chalkbrood. U. Soehngen, A. Tellier, P. Tognet, K. Richards,[3] and G. Whitfield[3]

The Entomology Program provided assistance to a research program sponsored by the Alberta Alfalfa Seed Producers' Association in which several methods of controlling chalkbrood in leafcutter bees were evaluated. Trials consisted of dipping nesting materials in a bleach solution, and applying fungicides to the nests and a buckwheat trap crop. The results were published in the Proceedings of the 6th Annual Canadian Alfalfa Seed School, Canadian Alfalfa Seed Council, Lacombe.

Biological Control of the Blackvine Weevil on Roses.

In the spring of 1986, roses in a commercial greenhouse became infested with blackvine weevils. An introduction of the insect parasitic nematode Heterorhabditis sp., at the rate of 5,000 nematodes per litre of soil, proved to be highly effective in controlling the weevils. Only dead larvae containing live nematodes were found after application of this biological control agent.

Biological Control of Thrips on Greenhouse Cucumbers. G. Grant, R. Rumney, and A. Tellier

Biological control of western flower thrips (Frankliniella occidentalis) was attempted using a predatory mite (Amblyseius cucumeris) in a cucumber greenhouse at AHRC. Regular monitoring revealed that the predators failed to become established in significant numbers, perhaps due to unfavorable

[1]Alberta Agriculture
[2]Canadian Cocoon Testing Centre technician.
[3]Agriculture Canada, Lethbridge.

environmental factors such as low relative humidity. However, the regular introductions were sufficient to suppress thrips populations. Cucumber yields and quality were comparable with commercial greenhouses where insecticides were used for control. Spider mite predators and whitefly parasites were also used in the same greenhouse and they functioned well enough to preclude the use of pesticides.

REGIONAL CROP LABORATORY PROGRAM

Project Leader: M. Dykstra
Consultants: R. Howard, U. Soehngen, R. Esau, K. Mallett, and A. Tellier

The southern Alberta Regional Crop Laboratory is one of four diagnostic facilities in the province, the main function of which is to provide diagnostic and extension services to commercial growers, horticultural businesses, home gardeners, and government staff. The year 1986 was the busiest ever, with a total of 1807 disease, insect, and unidentified plant specimens being received. This is a 20 percent increase over specimen receipts in 1985, largely due to wetter climatic conditions and more submissions of foliage plant specimens from interiorscapes.

Summaries of specimens submitted are presented in Tables 1 and 2. A more detailed account is published in the December 1986 edition of the AHRC Crop Protection Newsletter, Vol. 10, #12. Copies of this newsletter issue are available upon request from the Library, AHRC.

Table 1. Summary of disease and entomology specimens submitted to the southern Alberta Regional Crop Laboratory, January 1 - December 31, 1986

Crop category	Number of specimens		Category total	Commercial* (%)	Percent of total specimens*
	Disease	Entomology			
Woody Ornamental	299	134	433	2.4	24.0
Vegetable Crop	272	25	297	7.1	16.4
Interior Plantscape	259	20	279	11.5	15.4
Cereal Crop	121	27	148	8.1	8.2
Herbaceous Ornamental	79	21	100	1.0	5.5
Fruit Crop	78	17	95	0.2	5.3
Greenhouse Crop	89	18	107	4.6	5.9
Forage Crop	30	4	34	1.8	1.9
Special Crop	16	6	22	1.2	1.2
Oilseed Crop	6	3	9	0.4	0.5
Miscellaneous	39	22	61	1.0	3.4
Household Pest	-	33	33	0	1.8
Total	1288	330	1618	39.4	89.5
% total specimens	71.3	18.2	89.5		

*Percentage calculated on basis of all disease, entomology, and unidentified plant specimens (Total = 1807).

Table 2. Summary of unidentified plants submitted to the southern Alberta Regional Crop Laboratory January 1 - December 31, 1986

Category	Number of specimens	Commercial* (%)	Percent of total specimens*
Herbaceous Ornamental	70	0.1	3.9
Annual Crop	32	1.8	1.8
Pasture	27	0.5	1.5
Forage	11	0.6	0.6
Fallow	12	0.7	0.7
Water Course	11	0.4	0.6
Waste Area	9	0.2	0.5
Forested Land	3	0	0.2
Miscellaneous	15	0.3	0.8
TOTAL	190	4.6	10.5

*Percentage calculated on basis of all disease, entomology, and unidentified plant specimens (Total = 1807).

REGIONAL CROP LABORATORY PROGRAM - OLDS

Project Leader: S. Slopek

OBJECTIVES

The Regional Crop Laboratory at Olds provides a weed, disease, and insect diagnostic service, and conducts crop protection research and extension support for central Alberta producers and extension field staff. Research was conducted on the control of cereal diseases. Diagnostic, extension and research programs are summarized below.

DIAGNOSTIC SERVICES

The number of specimens handled in 1986 was 590, which was down slightly from the 651 specimens received in 1985. The drop was primarily in the area of ornamental diseases, where fewer drought-related problems were submitted. Table 3 provides a brief summary of the specimens submitted.

Extension Activities

An information package on barley leaf stripe was assembled and mailed to local district agriculturists. Talks were presented to commercial and amateur producers.

Disease Surveys

Disease surveys of verticillium wilt of alfalfa and virulent blackleg of canola were conducted in Census Division No. 8 as part of the provincially co-ordinated disease surveys. Neither disease was found. A survey-type approach was used to evaluate Alberta Agriculture's 'Sclerotinia Stem Rot Checklist.' It relied upon grower co-operation to complete the checklist and make disease counts. Response was poor and no conclusions could be reached. A more successful survey involved barley growers, who were asked to take leaf samples from their fields and submit them to the lab for disease analysis. Results from the survey indicate that losses in barley yield, due to leaf diseases, were estimated at 27%. A survey of wheat leaf diseases, under three different tillage systems, was conducted near Drumheller. Leaf disease levels in a no-till field were approximately double to those in the conventionally tilled field. The effect of flag leaf damage from hail was also investigated.

RESEARCH PROJECTS

Seed Treatment Evaluation for the Control of Common Root Rot and Loose Smut of Barley. S. Slopek and D. Orr[1]

Of the fifteen different seed treatments tested, a mixture of TF-3674 25 g/L LI and EL-228 5% WP was the most effective treatment in reducing root rot at all locations; however, no significant yield increases resulted. The most effective loose smut treatment was HWG 1608 2.5% which had, on average from all four locations, 90% less infection than the untreated check. Promising treatments will be tested again next year. The results were reported in the 1986 Pesticide Research Report of the Expert Committee for Pesticide Use in Agriculture, Agriculture Canada.

Evaluation of Fungicides for the Control of Barley Leaf Diseases.

Trial plots were set out in fields that were seeded and prepared by co-operating farmers. Three fungicides (Tilt 250 EC, Bayleton 80% WP, and Dithane M-45 80%) were evaluated for leaf disease control on 'Harrington,' 'Empress,' 'Leduc,' and 'Samson' barley. Yield increases of 35-40% were obtained by controlling scald (Rhynchosporium secalis) on 'Harrington.'

[1]Agriculture Canada, Lacombe

Table 3. Summary of specimens submitted to the central Alberta Regional Crop Laboratory, January 1 - December 31, 1986.

Crop Category	Number of Specimens			% of Total Specimens
	Disease	Insect	Weed	
Ornamental	100	55	19	29.5
Household	12	55	0	11.3
Vegetable	50	9	2	10.3
Fruit	30	14	0	7.4
Turf	14	0	2	2.7
Sub-total	216	133	23	61.2
Cereal	38	8	39	14.7
Forage	8	2	55	11.0
Oilseed	6	4	2	2.0
Storage	0	1	0	0.0
Sub-total	42	15	96	27.7
Miscellaneous	0	13	52	11.1
Total	258	161	171	100.0
Total Specimens (%)	43.7	27.3	29.0	

SPECIAL CROPS UNIT

This unit has facilities and technical resources to conduct applied research, extension, and development services on special crops such as pulse crops, field corn, mustard, sunflower, and other new crops. It is involved with other departmental programs in co-operative tests, primarily cultivar trials, on traditional field and forage crops.

Refe Gaudiel, B.S.A., M.Sc., Ph.D..... Unit Head and Research Agronomist
Collin Wildschut, Dipl. Hort. ..... Technologist

SPECIAL CROPS PROGRAM

Project Leader: R. Gaudiel
Technologist: C. Wildschut

OBJECTIVES

The responsibilities of the Special Crops Program are, applied research, extension, and developmental work on new and alternate field crops for Alberta. The program also provides service to other departmental staff and commodity organizations through co-operative tests and demonstration plots.

A detailed report of research projects involving pulse crops, other special crops, and forage crops is to be published in the AHRC pamphlet series in 1987.

RESEARCH PROJECTS

DRYBEAN CULTIVAR EVALUATION AND CULTURAL PRACTICES

Drybean Cultivar Trials.

Five types of trials, from preliminary screening tests to advanced yield tests, were conducted at Brooks, Bow Island, and Lethbridge to evaluate drybean cultivars, selections, and breeding lines for yield, maturity, and other agronomic characteristics. Several promising lines and cultivars from 1985 tests performed well in 1986. Several new lines and varieties of kidney, black, and small, white drybeans were found to be early maturing and merit further testing. The standard 'archetype' (tall, narrow-profile plant) varieties and lines were all late in maturity. However, a new small white line, received from Michigan State University, was early maturing and is, so far, the most promising 'archetype' line tested. Cultivar evaluation will continue in 1987.

Drybean Cultural Trials.

A total of four fertilizer experiments on drybeans were conducted to determine the effects on yield, of varying rates of nitrogen and phosphorus for soil-test calibration. The effects of various micronutrients on yield, and the yield response of different varieties to zinc applications were also studied. Increasing the rates of nitrogen and phosphorus up to 100 and 80 kg/ha (89 and 71 lb/acre), respectively, increased drybean yields in Lethbridge and Bow Island. Although the results of the micronutrient test were variable, there was a trend for yield to increase when zinc was applied to the soil. Drybean varieties responded differently to foliar applications of zinc with the navy and small white types showing the greatest increases in yield.

Trials were conducted at Brooks and Bow Island to determine the effects of various foliar-applied chemicals on pod set, the effect of spacing and population on yield, and the canning quality of four small white drybeans. None of the 'pod-set enhancing' chemicals increased the yield of drybeans.

Drybeans planted in rows 30 cm wide yielded approximately 20-45% more than drybeans planted in standard rows 60 cm wide. However, a plant population 50% greater than the normal plant population currently used, is needed to effectively increase the yield of drybeans planted in narrow rows. Quality evaluation of four small white drybean cultivars grown in Alberta versus that of those grown in Ontario and those harvested at different stages of maturity in Alberta are still being analyzed by Dr. M. Kaldy of Agriculture Canada Research Station at Lethbridge. The trials involving differing rates of nitrogen and phosphorous fertilizer, foliar fertilization, and spacing and population of 'archetype' drybeans will be continued in 1987.

NEW CROPS ADAPTABILITY, CULTIVAR EVALUATION, AND CULTURAL PRACTICES

Cultivar and Cultural Trials of Pulse Crops.

Evaluations of cultivars and breeding lines of fieldpeas, lentils, fababeans, soybeans, and lathyrus were done at Brooks, Bow Island, and Acadia Valley. Tests with fieldpeas have shown that 'Alaska' and the new semi-leafless cultivar 'Tipu' to be low yielding. The recently registered fieldpea cultivars 'Victoria' and 'Bellevue,' were among the top yielders. No new lentil cultivar or line yielded better than the standard cultivars. The lentil cultivar 'Eston' yielded the highest. A new red-seeded sister line of 'Eston' had a slightly lower yield and larger seed than 'Eston.' No outstanding new soybean and fababean lines were found, although there were some that were as good as the currently registered cultivars. The fababean 'Lacombe Bulk' was low yielding but early maturing. The new 'low-neurotoxin' lines of lathyrus yielded as well as the standard lines.

Several cultural studies were conducted at Brooks, Bow Island, and Lethbridge to determine the effect of foliar-applied chemicals on pod set of fababeans, the effect of varying rates of nitrogen and phosphorus on fieldpeas for soil-test calibration, and the growth pattern of several legume crops for green manure purposes. Foliar sprays of 'pod-set enhancing' chemicals did not affect the yield of fababeans. Grain yields of fieldpeas were not significantly affected by various fertilization rates of nitrogen and phosphorus both in Bow Island and Lethbridge. The time course dry matter accumulation study of several legume crops under dryland and irrigated conditions, indicates that small-seeded legumes such as lentils and Austrian winter pea may have potential for green manure. Cultivar evaluation and cultural trials on pulse crops will continue in 1987.

Other Cultivar and Cultural Trials of New Crops.

The performance of several cultivars and lines of sunflower, safflower, mustard, canary seed, proso, and foxtail millets was evaluated at Brooks, Bow Island, and Taber. Except for 'Sigco 964,' which was earlier maturing than the standard hybrids, no other outstanding new sunflower hybrid was observed. The new safflower cultivar 'Saffire,' continued to mature at least one week earlier but was slightly lower yielding than the other standard cultivars. Some of 'Saffire's' sister lines, previously selected for high oil content, were similar to 'Saffire' in yield and maturity. No outstanding new mustard, canary seed, or millet lines were observed.

Several trials were conducted at Brooks, Bow Island, and Taber to determine the effects of plant population and seeding rates on the yields and other agronomic characteristics of sunflowers and safflowers grown under irrigation and dryland conditions. Trials were also set-up at Brooks and Bow Island to determine the effect of various seeding dates on the agronomic performance of sunflower and safflower. The response of sunflowers to varying rates of nitrogen and phosphorus was investigated at Bow Island and Lethbridge for soil-test calibration purposes. Sunflowers continued to show slight yield differences within a population range of 45-75 thousand plants/hectare but the percentage of large seed produced is greatly affected by, and inversely related to, plant population. The effect of varying plant populations on the percentage of large seeds produced is much more pronounced on sunflower hybrids that are inherently small-seeded compared with those hybrids that are genetically large-seeded. Safflowers, under irrigation, produced satisfactory yields even when seeded at a low rate of 18 kg/ha (16 lb/acre), while dryland safflower yielded satisfactorily at a seeding rate of 12 kg/ha (11 lb/acre). Sunflower and safflower yields were highest when seeded during the first week of May. The nitrogen and phosphorous trials on sunflower at Lethbridge were damaged by birds. In Bow Island, sunflower yield was not affected by increasing rates of nitrogen; however, a phosphorous application of at least 40 kg/ha (36 lb/acre) increased yield. Cultivar evaluation and cultural trials, especially with sunflowers and safflowers, will be continued in 1987.

HERB AND SPICE ADAPTABILITY AND CULTURAL PROJECT

Demonstration Plot and Cultivar Evaluation.

Approximately 40 different kinds of annual and perennial spice and essential oil crops were grown in the herb demonstration plot. Most of these herb and spice plants were on display during the summer for visitors and were used at the AHRC annual field day. Eight fenugreek cultivars and lines were once again evaluated for yield and maturity. Fenugreek cultivars barely reached maturity by the time of the first killing frost. The herb and spice demonstration plots will be maintained in 1987.

CORN AND SORGHUM CULTIVAR AND CULTURAL PROJECT

Field Corn Hybrid Trials. R. Gaudiel and D. Dahl[1]

A total of four tests were conducted at Brooks and Bow Island to evaluate new grain and silage hybrids for licensing and recommendation purposes. These sites are part of a southern Alberta testing program sponsored by the Alberta Corn Committee. Approximately 40-60 entries were included in the tests. Crop growth was good at both locations. In spite of the cool weather in September, the plants produced satisfactory yield and quality. Yield and quality of the early hybrids were better than those of the late hybrids. Preliminary tests indicate that there is potential for producing hybrids that will mature earlier (100-150 less corn heat units) than the present earliest standard hybrid without reduction in yield. Hybrid trials will be continued in 1987.

[1]Seasonal technician.

Cultural Trials of Field Corn. R. Gaudiel and D. Dahl[1]

Varying rates of nitrogen and phosphorus were applied to grain and silage corn at Bow Island and Lethbridge to gather soil test calibration data. The grain test at Lethbridge was harvested as silage because of bird damage to the ears of corn. Results from these experiments will be combined with those from other years and a table of yield responses relative to various fertilizer rates for any given soil test level will be made. Fertilizer trials with nitrogen and phosphorus will be continued in 1987.

Two corn hybrids were planted in different plot sizes (single-row to 10-row plots) to determine the best plot size to use in evaluating corn hybrids. Shorter hybrids in a hybrid test that uses single-row plots may not show their true potential because of the overshadowing effect of adjacent taller plants. Different annual forage pasture crops were top seeded into standing corn to determine the feasibility of producing annual pastures in late fall after corn was harvested. Catch cropping annual forage crops for pasture into standing corn, even as early as the first week of July, does not appear to produce enough dry matter in late fall to be feasible under the short growing season in southern Alberta.

CEREAL AND OILSEED CULTIVAR AND CULTURAL PROJECT

Cereal and Oilseed Regional Tests. R. Gaudiel and A. Middleton[1]

In co-operation with the Field Crops Branch, Alberta Agriculture, Lacombe, new and standard registered cultivars of barley, hard red spring wheat, durum wheat, utility wheat, triticale, oats, flax, and canola were evaluated at three irrigated sites (Brooks, Bow Island, Standard) and one dryland site (Acadia Valley) for yield and other agronomic characteristics. These tests are part of a province-wide testing program for the purpose of making varietal recommendations. In addition, several advanced tests on breeding lines of barley, semi-dwarf barley, triticale, winter wheat, and winter triticale were conducted under irrigation at Brooks.

Maturity of plants in some trials was delayed by wet weather in September. In general, yields were good and quality was not affected by the wet weather because plants were standing during the adverse conditions. Data from the 38 test sites across the province were collected, analyzed, and used to revise the Alberta Agriculture recommendation factsheet entitled Varieties of Cereal and Oilseed Crops for Alberta - 1987. These tests are expected to continue in 1987.

The Effect of Water Regimes on Growth Pattern of Perennial Crops. R. Gaudiel, M. Braithwaite[1], and I.S. Selirio[2]

Alfalfa, brome grass, crested wheat grass, and alfalfa-brome grass mixture plots, established in 1983 and 1984, were irrigated with different amounts of water to determine the effects of different soil moisture levels on the growth and development pattern of forage crops. Information obtained from this study will be used to improve the forage crop insurance program of

[1]Seasonal technician.
[2]Research Scientist, Alberta Hail and Crop Insurance Corporation, Lacombe, Alberta.

Alberta. This project is funded by and done in co-operation with the Alberta Hail and Crop Insurance Corporation at Lacombe.

Several problems were encountered in maintaining soil moisture because of windy conditions and equipment breakdown. The irrigation treatments were not imposed until early June because irrigation water was lacking. Plants were mowed during late May which resulted in a late start of the trials. Consequently, this allowed only one harvest set. The growth rates of the forage crops were slightly faster than in previous years because of the warmer temperatures that prevailed during the course of the study. This study will terminate in 1987 after a series of harvests in spring and early summer is completed.

FORAGE CROPS

Cultivar and Cultural Studies on Annual Forage Crops. R. Gaudiel and A. Middleton[1]

The annual forage trials were those that were carried over from a Farming for the Future project that had been terminated in early spring. These trials were conducted to determine: spring management practices of fall-seeded winter cereals for pastures and grain production; potential annual crop species for pasture; whether annual crops are as good as perennial crops for pasture; seeding rates of annual crops for hay and pasture mixtures; catch cropping with annual pasture crops; performance of different annual crops for silage or hay; and performance of different brassica cultivars for late-fall grazing.

The results of the different trials indicated that several annual crops could be used effectively to supply adequate forage either as pasture, silage, or hay throughout the entire season. Double cropping, by under-seeding cereals intended for silage or hay with winter cereals or rye grass, can produce adequate pasture for late fall grazing. It is possible to spring-graze fall-seeded winter cereals until approximately mid-May without a significant reduction in subsequent grain or hay yields. Brassicas can be a high-yielding, palatable late-fall pasture crop. Some trials are expected to continue under a different program.

Evaluation of Perennial Forage Crop Cultivars. R. Gaudiel and A. Middleton[1]

In 1986, perennial forage plots that were established 5-6 earlier were again harvested. This provided additional information on the longevity and productivity of the different perennial forage crops. There is a dearth of information on the long-term productivity of various perennial forages. Data is being compiled with that from harvests during the early years after establishment. One or two more years of harvest data is still expected.

Extension and Service Activities

Information was provided on special, field, and forage crops to growers, agri-business, and extension and research staff by telephone, mail, and field

[1]Seasonal technician.

visits. Information was given to commodity groups through participation in commodity advisory committee meetings, seminars, courses, and field tours.

Special Crops staff acted as consultants and continued to provide the Chinook Applied Research Association with materials for their demonstration and research plots. Seeds of promising drybean and forage brassica cultivars were supplied to the Alberta Wheat Pool Bean Plant and to several farmer co-operators, for field-scale performance testing. Seed was also provided to other departmental staff and agricultural colleges for small demonstration plots. Assistance was given to several district agriculturists in the establishment and harvesting of their demonstration/research plots.

ADMINISTRATIVE SERVICES

This unit provides office management, purchasing, accounting services, budget control, and contact with Alberta Public Works Supply and Services.

Thomas R. Krahn, B.Sc. (Ag), M.Sc., P.Ag.	Director
Huber Ellis	Administrative Officer
Priscilla Petersen	Secretary & Personnel
Anna Moeller	Accountant
Betty Ann Humphreys	Receptionist & Timekeeper
Joyce Clark	Librarian & Hostess

FARM OPERATIONS

This section provides general farm support operations for the Center. This includes the repair and maintenance of equipment used in all farming operations.

Evert Borkent, Dipl. Hort.	Farm Manager
Henry Christesen	Assistant Farm Manager
William Coffey	Stockkeeper
Berend Witteveen	Mechanic
Barry Merkl	Maintenance Worker
David Houseman	Farm Worker
Ludolf Velting	Farm Worker
William Wise	Farm Worker

PUBLICATIONS AND PRESENTATIONS - 1986

ABSTRACTS

In *Report of the Committee on Horticultural Research, Canadian Horticultural Council, March, 1987*

- Tolerance of onions to bromoxynil. R. Esau
- Quackgrass control in saskatoons. R. Esau
- Sweet corn - Mulch and tunnel evaluation. L. Hausher
- Winter Squash - Mulch and tunnel evaluation. L. Hausher
- Light fall frost protection. L. Hausher
- The efficacy of fungicides and soil wetting agents for the control of Pythium damping-off of cucumbers. R. Howard and M. Briant
- An assessment of fall subsoiling for root rot management in processing peas. R. Howard and E. Moskaluk
- Evaluation of fungicides for the prevention of seed-piece decay of potatoes. K. I. Mallett and C. Schaupmeyer
- Physical characteristics of saskatoon berries. T. Smyrl
- Soluble solids and moisture content of onions. T. Smyrl

In *Research Report, Expert Committee (Western Canada), December, 1986. Abstracts by R. Esau and V. Rumney except as noted.*

- Weed control in carrots.
- Graminicides for use in cole crops, carrots, and onions.
- Weed control in cabbage.
- Efficacy of two herbicides for squash with or without plastic mulch.
- Fumigants for zucchini squash production.
- Tolerance of lettuce, radish, and garlic to trifluralin.
- Postemergence treatments for weed control in onions.
- Tolerance of onions to bromoxynil.
- Chemigation treatment for onions.
- Postemergence weed control in potatoes.
- Pre-emergence herbicides for control of annual weeds in potatoes.
- Herbigation for potatoes.
- Tolerance of Shepody potatoes to metribuzin.
- Weed control in processing peas.
- Grassy weed control in processing peas.
- Weed control in sweet corn.
- Effects of delayed incorporation on efficacy of two thiocarbamate herbicides.
- Weed control in dry beans.
- AC 263,499 for weed control in dry beans.
- Effects of chlorsulfuron on succeeding rotation crops.
- Effects of DPX-T6376 on succeeding rotation crops, 1984.
- Effects of repeated application of chlorsulfuron and DPX-T6376 on succeeding rotation crops.
- Weed control in established saskatoons.
- Weed control in established saskatoons. R. Esau and J. Kitt.
- Quackgrass control in an established saskatoon orchard. R. Esau and J. Kitt.

In *Pesticide Research Report, 1986, Expert Committee for Pesticide Use in Agriculture, Agriculture Canada, Ottawa.*

- An evaluation of two fungicides and three application methods for the control of white mold on dry peas, 1986. R. Howard and E. Moskaluk

- Evaluation of fungicides for the prevention of seed-piece decay of potatoes. K. I. Mallett and C. Schaupmeyer

- Evaluation of seed-treatment fungicides for control of seed- and soil-borne stem smut of fall rye, 1986. B. J. Puchalski, F. R. Harper, and R. J. Howard

- Seed treatment evaluation for common root rot control in barley, 1986. D. D. Orr, J. G. N. Davidson, P. D. Kharbanda, and S. W. Slopek

- Seed treatment evaluation for Loose smut control in barley, 1986. D. D. Orr, J. G. N. Davidson, P. D. Kharbanda, and S. W. Slopek

- Evaluation of seed treatment fungicides in controlling seed- and soil-borne bunt of winter wheat, 1986. B. Puchalski, F. R. Harper, and R. J. Howard.

- Evaluation of Tilt 250EC for control of scald and net blotch in barley, 1986. S. W. Slopek.

RESEARCH REPORTS

AHRC Pamphlet Series

Casement, E. B. 1986. 'Golden Prairie Arboretum.' AHRC Pamphlet 87-1.

Casement, E. B. 1986. 'Annual Flower Trials - 1986.' AHRC Pamphlet 87-2.

Casement, E. B. 1986. 'Woody Ornamental Plant Trials.' AHRC Pamphlet 87-3.

Esau, R. 1986. 'Chemical Weed Control in Red Table Beets.' AHRC Pamphlet 86-9.

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Gaudiel, R. 1986. 'Special Crops Research Activities in 1985-AHRC.' Expert Committee on Grain Breeding, Winnipeg. February.

*Hausher, L. G. 1986. 'Early Crop Production,' 'Planning and Management,' 'Alberta Strawberry and Raspberry Production.' Market Garden Short Course. Red Deer. January.

Hausher, L. G. 1986. 'Alberta Vegetable Production' and 'Alberta Mulch and Tunnel Production.' Lower Mainland Horticultural Improvement Association Growers Short Course. Abbottsford. February.

Hausher, L. G. 1986. 'AHRC Vegetable Research Trials,' AHRC Fruit Research Trials,' and 'Alberta Vegetable Production.' Fruit and Vegetable Council Meetings of WCSH. Winnipeg. February.

*Hausher, L. G. 1986. 'Alberta Mulch and Tunnel Production.' Univ. of Alta. Horticultural Workshop. Edmonton. April.

Hausher, L. G. 1986. 'Costs and Returns of Vegetable Production.' Agriculture Workshop for Lenders. Olds. June.

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Krahn, T. K. 1986. 'Economic Status of the Horticultural Industry in Alberta.' Western Canadian Society for Horticulture, Annual Meeting, Winnipeg. February.

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Casement, E. B. 1986. '1986 Ornamentals Research at AHRC.' Environmental Horticulture Advisory Committee Meeting, Olds. November.

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Gaudiel, R. 1986. 'Progress Report of Some Pulse Crop Trials.' Alberta Pulse Crops Advisory Subcommittee Meeting, Lethbridge. December.

Gaudiel, R. 1986. 'Progress Report of Some Special Crops Trials.' Special Crops Advisory Committee Meeting, Lethbridge. December.

Howard, R. J. 1986. 'Update on Verticillium Wilt of Alfalfa.' Annual Meeting of the Alberta Forage Advisory Committee, Edmonton. November.

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Casement, E. B. 1986. 'Plant Hardiness,' 'Plant Structures,' and 'Pruning Trees,' Pruning Course, Brooks. March.

*Casement, E. B. 1986. 'Landscaping for Rural Homes,' Lethbridge. February.

*Casement, E. B. 1986. 'Grafting and Budding,' Practical Course to Nurserymen, Red Deer. March.

*Casement, E. B. 1986. 'Keeping Your Yard Looking Its Best,' Airdrie. March.

*Casement, E. B. 1986. 'Landscaping for Dry Land Farms,' Allerston. March.

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*Casement, E. B. 1986. 'Farmstead Shelterbelts' to County of Wheatland and Farm Tour. August.

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*Dykstra, M. D. 1986. 'Diagnosing Plant Disorders.' Annual Meeting of the Alberta Greenhouse Growers' Association, Lethbridge. November.

Esau, R. 1986. 'Weed Control in Market Gardens.' Market Garden Short Course, Red Deer, January.

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*Gaudiel, R. 1986. 'Sunflower Fertility and Plant Population.' Sunflower School, Taber. February.

*Gaudiel, R. 1986. 'Drybean Varieties and Zinc Fertilization.' Alberta Wheat Pool Bean Seminar, Bow Island. February.

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*Howard, R. J. 1986. 'Update on Greenhouse Cucumber Disease Control Recommendations.' AHRC Greenhouse Open House, Brooks. September.

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*Howard, R. J. 1986. 'Diseases of Interiorscape Plants in Alberta.' Annual Convention of the Alberta Greenhouse Growers' Association, Lethbridge. November.

*Krahn, T. R. 'Free Trade - Potential Effects on the Alberta Greenhouse Industry.' Alberta Greenhouse Growers' Association Annual Meeting, Lethbridge. November.

*Mallett, K. I. 1986. 'Vegetable Storage.' Market Gardeners' Course, Red Deer. January.

*Mallett, K. I. 1986. 'Tree Diseases.' Tree Pruners' Course, Brooks. April.

*Mallett, K. I. 1986. 'Potato Disease Research Update.' Chipman-York Growers Seminar, Taber. March.

*Mallett, K. I. 1986. 'Turf Grass Pest Research in Western Canada.' Pesticide Applicators Training Course, Olds. March.

*Mallett, K. I. 1986. 'Tree Disease Problems.' Pesticide Applicators In-Service Training Course, Red Deer. April.

*Mallett, K. I. 1986. 'Shelterbelt Problems.' Agricultural Service Board In-Service Training Course, Brooks. June.

*Mallett, K. I. 1986. 'Bacterial Ring Rot and Other Important Potato Diseases.' Inspectors In-Service Training, Brooks.

*Schaupmeyer, C. 1986. 'New Concepts for Home Gardeners.' Annual Meeting of the Alberta Horticultural Association, Calgary. April.

*Schaupmeyer, C. 1986. 'Nitrogen Fertilization of Potatoes.' York Farms Potato Workshop, Taber. March.

Seymour, N. 1986. 'Pruning Shrubs,' Pruning Course, Brooks. March.

*Slopek, S. W. 1986. 'Back Yard Pest Management.' Home Gardener Meeting, Rimbey. March.

*Slopek, S. W. 1986. 'Developing Disease Control Strategies,' Pesticide Applicators' Course, Olds. March.

*Slopek, S. W. 1986. 'Using Computers for Statistical Analyses.' Experimental Design Class, Olds College. February.

*Slopek, S. W. 1986. 'Plant Diagnostics in Alberta.' Field Crop Insect and Disease Class, Olds College. February.

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*Slopek, S. W. 1986. 'Disease Epidemiology and Plant Pathology Techniques.' Advanced Plant Pathology Class, Olds College. February-March.

*Slopek, S. W. 1986. 'Barley Diseases in Central Alberta in 1986.' Barley Growers' Meeting, Innisfail. September.

*Slopek, S. W. 1986. 'Major Field Crop Diseases in Central Alberta in 1986.' Grower Meeting, Didsbury. November.

*Soehngen, U. 1986. 'Pest Control in the Home Garden.' Horticulture Week, Medicine Hat. March.

*Soehngen, U. 1986. 'Identification and Control of Garden Pests.' Golden Acre Garden Sentres In-Service Seminar, Calgary. March.

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Mallett, K. I. 1986. 'Dutch Elm Disease in Alberta.' Prairie Landscape Magazine IX:4.

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APPENDIX I.

METEOROLOGICAL REPORT

Summary of 1986 Weather and Growing Season - G. Smith

May, June, and July had cool-to-average temperatures, low-to-average hours of sunshine, and precipitation 160% of the 52-year average for the area.

Table 4. Maximum, minimum, and mean temperatures (°C) at the Alberta Horticultural Research Center, Brooks, 1986

Month	Extremes for month		Means for month			
	Maximum temperature	Minimum temperature	Maximum mean temperature	Minimum mean temperature	Mean	31-year average mean Temperature
January	13.5	- 19.0	3.7	- 7.4	- 1.8	- 13.9
February	14.0	- 36.0	- 4.7	- 16.6	- 10.6	- 8.8
March	21.5	- 12.5	9.7	- 3.0	3.3	- 3.4
April	23.0	- 12.5	12.5	- 3.0	4.7	5.1
May	34.0	- 3.5	18.8	5.2	12.0	11.8
June	34.0	4.5	23.6	10.0	16.8	16.0
July	30.0	6.0	23.4	9.6	16.5	19.8
August	33.5	1.5	26.3	9.4	17.3	18.1
September	24.5	- 2.0	13.5	4.1	8.8	12.1
October	24.5	- 7.5	15.0	0.0	7.5	6.1
November	14.0	- 26.0	0.0	- 11.9	- 5.8	- 3.3
December	11.5	- 17.5	2.7	- 9.2	- 3.2	- 9.5

Table 5. Temperature, precipitation, and sunshine data for the growing period May 18 to September 5, 1986

Month	Growing period above 1.6°C	Precipitation for growing period	Precipitation for month	Sunshine for growing period	Sunshine for month	Frost free period	Heat units
May 18-31	15	8.1	54.3	163.2	248.7	15	274
June	30	30.5	30.5	286.1	286.1	30	574
July	31	63.0	63.0	292.0	292.0	31	590
August	31	11.8	11.8	303.6	303.6	31	617
September	5	11.9	140.9	27.2	106.0	5	73
TOTALS	112	125.3	300.5	1072.1	1236.4	112	2128

APPENDIX II.

ORGANIZATIONAL CHART